MIDRANGE GPU DEATHMATCH
$200 videocards tested and verdictized

6 BUDGET CASES REVIEWED
Will $100 buy you a killer PC enclosure?

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MINIMUM BS • JULY 2008

12 PC Hardware HACKS

Do-It-Yourself Projects for **ALL** PC Enthusiasts

SOUNDPROOF
Your PC

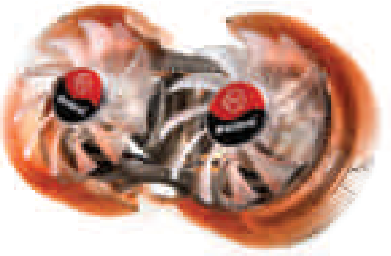
SUPERCHARGE
Your Wi-Fi Router

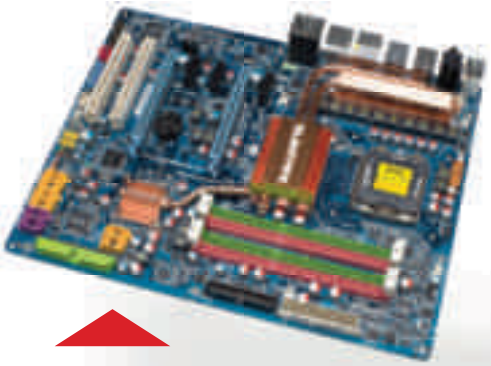
INSTALL
A Media Reader

TRIPLE
Your Screen Space

PLUS 8 More How Tos

INSIDE
The Best Air Cooler
We've Ever Tested?





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JULY

FEATURES

22 Hardware Hacks
Get your toolkit! We show you 12 fantastic ways to tweak your rig!

38 Motherboard Showdown
Four motherboards, two chipsets: Who will reign supreme in this battle?

52 Cheap Case Roundup
We're scraping the bargain bin for this six-case challenge. Only sub-$100 chassis need apply!

DEPARTMENTS

QuickStart

08 NEWS Is ray tracing for real?

14 THE LIST 10 things that are wildly overhyped

16 DEATHMATCH Nvidia GeForce 8800 GTS vs. AMD Radeon HD 3870

R&D

62 WHITE PAPER Ethernet: How your rigs talk to each other

63 AUTOPSY HP TouchSmart IQ770

64 HOW TO Organize and tag videos

In the Lab

73 REVIEWS

84 LAB NOTES

96 RIG OF THE MONTH

LETTERS

18 WATCHDOG

68 DOCTOR

94 COMMENTS

MAXIMUM PC

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Where Lies the Point of Diminishing Returns?

This month, I tested HP's Mini-Note—the small, cheap notebook is HP's answer to the subcompact, sub-$500 Asus Eee PC. HP's tiny notebook got me thinking about the point of diminishing PC returns—the point at which adding more hardware oomph doesn't deliver a perceptible performance boost to the user. During the usability portion of my testing—wherein I use the laptop in a variety of real-world scenarios (at my desk, on the kitchen table, on the couch, on the plane, etc.), I was shocked that the Mini-Note seemed fast enough for much of what I do. While the notebook certainly underperformed in our Photoshop benchmark, I didn't have any major complaints with its performance in my most common activities: web browsing, checking email, writing documents, and listening to music. Is this Mini-Note's 1.2GHz VIA C7-M CPU fast enough for me?

Answer: no. After I dug a little deeper, I uncovered some serious performance problems. The rig is simply too slow to play H.264 video at DVD resolution, and without dedicated graphics, I wouldn't recommend running even the most rudimentary 3D games.

The Mini-Note doesn't trip the diminishing-returns perimeter wire, but it comes close. It's too bad HP didn't include decent onboard graphics (something with basic 3D support and a little bit of video decoding help) because that would make this sub-$1,000 rig everything I need in a portable.

Ironically, it's at the *other* end of the PC hardware spectrum that I discovered technology that has indeed reached the point of diminishing returns. And I'm sad to report that that technology is 3D gaming graphics. Take a look at two of the biggest games of last year, Call of Duty 4 and Crysis. Crysis is a technological showcase, utilizing the latest, greatest DirectX 10 graphics technology to render a vibrant, living world. Call of Duty 4, meanwhile, is a showcase of last-generation DirectX 9 technology. This game is technically inferior but deftly executed.

Now, were you to show both titles to a gamer who doesn't know what subtle, delicious effects to look for in DirectX 10 rendering, there's absolutely no guarantee that he'll pick Crysis as the more advanced game. In fact, because there are more characters onscreen at any given time in Call of Duty and because the scripted action is much more intense than it is in Crysis, I'd wager that he's more likely to select Call of Duty as the more visually sophisticated game.

The upshot is that I think we're rapidly approaching the limits of what today's technology can deliver in terms of visual quality increases. In order to make the next jump—the jump to real-time 3D rendering that looks as good as prerendered movie CGI—the hardware vendors and game developers are going to have to try something new. Am I right, wrong, or absolutely crazy? Let me know at will@maximumpc.com.

HOLY COW!

Killer Hardware Hacks
page 22

How Ethernet Works
page 62

The Companion Cube
page 96

LETTERS POLICY Please send comments, questions, and tacos to will@maximumpc.com. Include your full name, city of residence, and phone number with your correspondence. Unfortunately, Will is unable to respond personally to all queries.

THE NEWS

Is Ray Tracing the Next Big Thing?

Intel is talking up the graphics technology in preparation of its Larrabee launch, but game developers are having none of it —MICHAEL BROWN

The rumor mill is abuzz with speculation that Intel's upcoming graphics processor, code-named Larrabee, will be a ray-tracing powerhouse—but a 98-pound weakling at rasterization, the rendering technique used in current games.

So what the heck is ray tracing? It's a rendering technique that traces the path of light as it travels from the camera through the pixels in an image plane. An algorithm tests each ray of light to determine if it intersects with any objects in the scene and then takes into account the material properties of those objects to determine the color of the pixel it will render. Ray tracing is capable of producing incredibly photo-realistic three-dimensional scenes, but it is massively expensive from a computational point of view.

"As part of its run-up to the Larrabee launch, Intel is making a big deal about ray tracing," said industry analyst Jon Peddie. "They've been showing ray tracing to IDF [Intel Developer Forum] attendees, software developers, analysts, press, and OEMs, trying to build up enthusiasm for the concept.

Intel research scientist Daniel Pohl used a ray-tracing technique to create this conversion of Quake 4. (Image credit: Daniel Pohl, Intel; Quake 4 content by Raven Software.)

LARRABEE WILL BE UNLIKE ANY SOLUTION THAT NVIDIA AND AMD CURRENTLY HAVE TO OFFER.

We love ray tracing, but it has been a challenge to implement and is almost impossible to do in real time."

And, in fact, today's graphic processors, typified by Nvidia's GeForce and AMD's ATI Radeon HD product lines, are based on an entirely different rendering technique—rasterization and shading—and it is this technique that the games industry currently revolves around. Rasterization takes a three-dimensional scene constructed from polygons and renders it to the two-dimensional surface of a monitor; shading describes the process of changing the color of a polygon based on its angle to and distance from a light source.

But since Intel has been making so much hay about ray tracing lately, influential game developers such as John Carmack (id Software) and Cevat Yerli (Crytek) have gone on record to play down the technique's value to the games industry—at least within the next five years. Intel is expected to demo Larrabee later this year, but the product is not scheduled to launch until 2009 or 2010.

When we asked Intel's Nick Knupffer for comment, he seemed taken aback by the perception that Larrabee would be a weak rasterizing solution: "There would be little point in us creating a discrete graphics part if it was not competitive," said Knupffer. "We've been talking about ray tracing on the one hand and Larrabee on the other, and I think people have incorrectly equated the two. But Intel has focused on DirectX and OpenGL from day one."

Knupffer also assured us, however, that Larrabee would be unlike any solution that Nvidia and AMD currently have to offer. "We haven't disclosed much about the architecture," he said, "but it would be safe to say that it's a fresh approach to graphics processing." Jon Peddie speculates that if Intel is to support rasterization, "It will be via a unified memory architecture, because as far as I know, Larrabee has no graphics circuitry, and that means it will be intrinsically limited in performance."

Q&A

Firing up the Platters of Seagate's CEO

Bill Watkins has little love for SSDs—at least, for now

Q When does Seagate plan to launch its own SSD or flash storage?

A We don't think [SSD for] notebooks make a lot of sense yet. We don't think desktops make a lot of sense yet. We think enterprise probably has a pretty good opportunity. It'll be three or four years out, but we think that enterprise, with tiered storage, makes sense.

We're indifferent. It's about putting together a solution that meets the customer's needs. So if I have to have an optical device, I'll use that. If it's a solid-state device, I'll use that.

Q Is Seagate's patent litigation against SSD manufacturers a foot in the marketplace's door?

A They can't steal from me. If they want to do new technology, great, then go do new technology. But don't sit there and steal all my technology and then think you're doing something. What's great about STEC—they didn't deny they were stealing. They're trying to say [the patents] are not valid. If they weren't valid, why did [the Patent and Trademark Office] grant them to me?

Q Who wins the race in the end? A bigger and faster Seagate drive or high-capacity flash memory?

A If solid state gets a good cost-for-performance, Seagate will have a version. Again, it's a chip. It's not a solution. You have to create a solution. A hard drive is not the head and the disk, those are components. A hard drive is all that happens once you record those bits on the head and disk. How do you handle that data? How do you interact with the Microsoft operating system? How do you error correct? How do you do interface? How do you connect to the PC, to the notebook, to anything?

All that stuff—we developed that technology. You don't get to come in and steal it from me. What amazes me: Drive guys all cross-license. The solid-state guys seem to want to argue everything in court, which is fine. –DM

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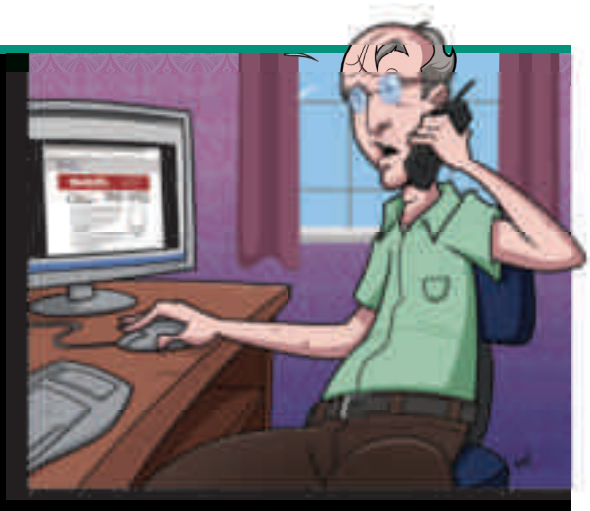
WORD WATCH

Vishing



You've probably heard of phishing, whereby a spoof of a legitimate website lures unsuspecting users into providing personal and financial information. Well, add VoIP (voice over IP) to the mix, and you've got vishing.

Victims either receive a VoIP call from, or are instructed via email to place a call to, an ostensibly legitimate institution requesting sensitive information. VoIP's capacity for caller ID spoofing gives the interaction credibility—and VoIP account holders enjoy a level of anonymity they don't get with a traditional landline. –KS

FAST FORWARD

Another One Bites the Dust

Will they never learn? Another start-up hoping to compete with mighty Intel has crashed, sending some 200 engineers to the unemployment line and squandering about $74 million from disgruntled investors. Montalvo Systems, originally named MemoryLogix, is now just another smoking crater in Silicon Valley.

Montalvo was developing an x86-compatible microprocessor to compete with Intel's low-power notebook processors. But Montalvo's multicore design never reached market. The initial simulations didn't meet expectations, and the engineers labored overtime to fix the problems. Meanwhile, the company's cash kept dwindling. Last-ditch attempts to raise more funding failed. Eventually, the owners had little choice but to fold.

Sun Microsystems has purchased Montalvo's assets for the relative pittance of a few million dollars. Those assets are almost entirely patents—some issued, most pending. It appears that Sun has little interest in hiring Montalvo's engineers or in continuing their project. More than six years of Montalvo's development work will most likely be abandoned.

I'm not happy to say I'm not surprised. Competing with Intel in the x86 arena is almost suicidal. Even a big company like AMD can barely hang on, and VIA Technologies is struggling, too. Start-ups have become a long shot.

Remember how Transmeta got steamrollered? Although Transmeta's x86-compatible Crusoe and Efficeon processors were innovative, they failed to capture much market share from Intel. Transmeta survives, but only because of a cash settlement from Intel in a patent dispute. Crusoe and Efficeon are gone. Transmeta's sole cash business is licensing some power-saving technology the company developed.

I think the sorry fates of Transmeta and Montalvo will discourage any future start-ups from designing x86 processors to compete directly with Intel. Not everyone agrees. My former colleague at *Microprocessor Report*, Peter Glaskowsky, thinks new competition is still feasible. (Peter was a key person at Montalvo. One of the company's founders was Peter Song, another former *MPR* analyst.) However, my conclusion is that investors will no longer risk the big money needed to challenge Intel on its home turf. AMD may win a match now and then, but in the long run, Intel rules the x86.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.

Warbots Rebel

Looks like the U.S. Army's plans to offload combat duties to remote-controlled robots has backfired—or rather, misfired. Just last summer, the Army was full of optimism regarding its Special Weapons Observation Reconnaissance Detection Systems (SWORDS), deploying three of the M249-machine-gun-wielding machines to Iraq as an experiment. Now, after one of the remote-controlled SWORDS defied commands and aimed its gun at a friendly target, the weapons have been recalled—and the Army's warbot deployment program put on hold indefinitely.–KS

Apple vs. the Big Apple?

Tech giant opposes NYC environmental program's logo

Fresh off of settling a 29-year-long series of trademark infringement and breach of contract lawsuits with the Beatles's Apple Corps media company, Apple is now taking on the city of New York, filing an opposition to the city's trademark application for its GreeNYC program logo. In the filing, Apple states that the GreeNYC's stylized apple logo could "cause confusion, mistake, or deception in the minds of consumers as to the origin or source of the applicant's good and services...."

Previously, Apple stated it was "silly" to think consumers would confuse Cisco's VoIP phone, also dubbed the iPhone, with Apple's mobile device. Apparently, though, the tech giant believes that consumers will think a government-sponsored program designed to shrink New Yorkers' carbon footprint is being sponsored by Apple. The company had no comment on the filing as we went to press.–TE

Apple Corps, Apple Inc., and GreeNYC logos. See any differences?

Racetrack Memory Makes Strides

Computer storage is a two-horse race right now: You can cheer for solid-state devices or hard disks, and that's it. But if scientists at IBM's Almaden Research laboratory perfect their new brand of three-dimensional memory, we'll see a speedy new steed enter the field.

The technology is called racetrack memory. It consists of U-shaped nanowires arranged perpendicular to a read-write base. On each wire are a number of individual magnetic domain walls that store your chunks of data. When an electric current passes through a nanowire, it shifts these domain walls up and down the wire, back-and-forth over the read/write heads.

The benefit of the technology is that the nanowires can be densely packed onto a single memory chip, making the tech capable of far more storage capacity than today's solid-state devices. But since racetrack memory requires a high current to work, heat issues are the big hurdle facing the IBM research team.

Racetrack memory's ultimate potential is SSD-like performance at the price of a typical hard disk drive. An extreme price-performance ratio is what's currently keeping solid-state storage out of the average consumer's machine.–DM

GAME THEORY

Bad for Kids?

We're at a point in history when, if gamers are to maintain credibility, we need to acknowledge both the good and bad in our passion. *Grand Theft Childhood* ($25, Simon & Schuster) by Lawrence Kutner and Cheryl K. Olson is a fair and comprehensive study of games and violence, and we would do well to pay attention to its conclusions.

The good: After thorough research, the team utterly dismisses the outrageous claims about games inspiring real-life violence. For example, gaming gadfly Jack Thompson states outright that since Virginia Tech shooter Seung-Hui Cho played Counter-Strike in high school, the game was responsible for the acts he committed: "These are real people that are in the ground now because of this game. I have no doubt about it," Thompson explained. Kutner and Olson, as well as the Virginia Tech Review Panel and the FBI, are having none of it, stating there is no linkage between criminal violence (particularly school shootings) and violent games.

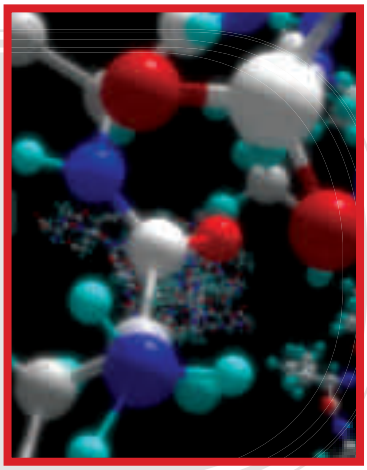
The bad: There *is* a correlation between middle school children who play violent, M-rated games and actual antisocial behavior. These kids aren't carjacking old ladies, pistol whipping store clerks, or defeating alien invaders with any greater frequency than their peers, but they tend to "act up" more, get in trouble in school, fight, and disrupt class.

Kutner and Olson refuse, however, to make a conclusion about which direction that cause/effect relationship travels. Are aggressive kids drawn to M-rated games, or do the games make them aggressive? Even with their large data set, Kutner and Olson are reluctant to blame games as the sole factor that affects children's behavior. Logic dictates that no 13-year-old should be playing Grand Theft Auto, the most played game among boys (and the second most played among girls, who preferred The Sims by a slimmer-than-expected margin), simply because they're not psychologically equipped to parse the violent, amoral, and satiric elements of the series.

Grand Theft Childhood is a refreshing mixture of hard science and common sense. I approached this study expecting more heat than light and came out illuminated. It's going to be a vital element in the upcoming debates as politicians attempt to score points by cracking down on violence in gaming.

Thomas L. McDonald has been covering games for 17 years. He is an editor at large for *Games* magazine.

Every PC Counts



Folding@home, Stanford University's distributed computing project, has been around since 2000, but its ongoing contribution to medical science bears revisiting. By harnessing the spare CPU and GPU cycles of hundreds of thousands of individual PCs, researchers are able to study protein folding and thus better understand the causes of common diseases such as Alzheimer's and Parkinson's. To join ***Maximum PC's*** *folding team, download the Folding@home software from* ***http://folding.stanford.edu*** *and register with team 11108.*–KS

AMD's Tri Core

When four cores are too many and two are not enough

If the gods give you lemons, make lemonade. And if the fabs give you bunk quad-core procs, you make tri cores. At least AMD does.

The company has just introduced the 2.4GHz Phenom X3 8750, the 2.3GHz Phenom X3 8650, and the 2.1GHz Phenom X3 8450 tri-core chips. All three feature the same cache size as the quad-core Phenoms and are mainly targeted at consumers on a dual-core budget who want a little more bang for their buck. The chips are priced at $195, $165, and $145, respectively.

AMD's new 50-series tri core is free of the dreaded TLB bug.

AMD's main problem is that its fastest CPU, the quad 2.5GHz Phenom X4 9850, costs just $230. Intel is also a factor, having lowered the price of its older quad cores to compete against AMD. For example, Intel's 2.4GHz Core 2 Quad Q6600, which outperforms *any* Phenom, is $219 and dropping.

Fortunately, all three of AMD's tri cores are free of the TLB bug that hurt performance in the original quad-core Phenom chips.–GU

PlaysForSure Won't

Microsoft kicks old DRM scheme (and consumers) to the curb

As of August 31, Microsoft is shutting down the DRM authorization servers for tunes purchased from its MSN Music store. That means the PlaysForSure-shackled music will be forever after confined to the hardware it resides on at that time; if you get a new PC, lose a hard drive, or even switch your OS, too bad—your music's not moving. It's a raw deal, but it's not unprecedented. Customers of the now-defunct Sony Connect and Virgin Digital stores, which each had their own proprietary forms of copy protection, find themselves in a similar pickle. Microsoft's answer is for customers to back up their MSN Music purchases onto a CD and then transfer the music (in its degraded state) to future systems. Meanwhile, the company is staunchly sticking with the proprietary DRM used in music sold through its Zune Marketplace—for now.–KS

BYTE RIGHTS

Getting Away (from DMCA)

Summer is upon us, and it's a perfect time to take a fair-use vacation.

Here in America you can buy plenty of DVDs, but if you want to copy them for personal use or run them on Linux, it's another story: You'll be breaking U.S. law. To make that backup of your kid's favorite Disney movie before it gets covered in blue marker, consider going somewhere you won't go to jail for the act.

Who doesn't love a Caribbean island? Imagine yourself on a beach in Antigua with a drink that comes in a hollow coconut. Beautiful women walk by. The sun begins to set, and you've just finished importing your DVD collection to a hard drive. Antigua and Barbuda is home to SlySoft, the maker of AnyDVD, a program that sits in the background of your computer and quietly removes copy protection from DVDs, including HD formats. As SlySoft was doing its thing in 2007, in the United States the AACS Licensing Authority was threatening to sue Digg for publishing a number—the HD DVD encryption key.

Or maybe you're a do-it-yourselfer who can't take the heat. Consider a trip to Norway, where you can roll your own DRM breaker. In 2002, Norwegian courts acquitted Jon Johansen of charges stemming from the creation of DeCSS, which stripped copy protection off DVDs so he could play them on his Linux box. By contrast, back in the U.S., a court convicted *2600* magazine for *linking* to DeCSS.

Perhaps you're a pedagogical type with a penchant for long days and vodka. Russia's your spot. In 2001, Moscovite Dmitri Sklyarov presented a flaw in Adobe's eBook security at Black Hat in Las Vegas. This information didn't stay in Vegas—Adobe had him arrested. Back in Mother Russia, telling people how to circumvent Adobe's weak protection isn't illegal. After a harrowing ordeal, Sklyarov was allowed to return home, where he continued his research in peace.

Turns out none of these vacations is about piracy. They violate the DMCA, not copyright. The fact is, you can go almost anywhere in the world and you won't run into these restrictions. So have fun on your trip! It's your computer.

Quinn Norton writes about copyright for Wired News and other publications. Her work has ranged from legal journalism to the inner life of pirate organizations.

THE LIST

10 Things That Are Wildly Overhyped!

10 MULTIPLE-GPU VIDEOCARDS

9 NINTENDO WII

So much potential squandered on so many terrible games and so few high points.

8 WILL WRIGHT'S SPORE

Will it change the world? Will it ever be released? Will it be fun? We don't know.

7 64-BIT COMPUTING

PCs can address more than 4GB of memory now—big whoop. We want more native 64-bit apps.

6 BATTLESTAR GALACTICA

Once-awesome sci-fi is now *Melrose Place* in space. Meh.

5 DOWNLOADING MOVIES FROM THE INTERNET

4 FACEBOOK

Distracting? Yes. Fun? Yes. Revolutionary? No.

3 HIGH DEFINITION

By the time HD is *finally* mainstream, it will be time to upgrade to UHD (*ultra*-high def).

2 ASUS EEE PC

The hoopla surrounding this cheap notebook has launched an entire product category. Think about that.

#1 THE IPHONE

It's indubitably cool, but nothing could have lived up to its hype overdose—especially without 3G support!

DEATHMATCH

Nvidia GeForce 8800 GTS vs. AMD Radeon HD 3870

As much as we enjoy putting ultra-high-end videocards through their paces, we know that most people buy more modest components. Fortunately, the products in this price range have never been more powerful.

The big question now is, Who provides the biggest bang for the buck? We pitted AMD's Radeon HD 3870 (equipped with 512MB of GDDR4 RAM) against Nvidia's GeForce 8800 GTS (the model based on the G92 and outfitted with 512MB of GDDR3 RAM) to see who delivers the best price/performance ratio.

The HD 3870 has nearly three times as many stream processors and boasts higher-end memory and higher clock speeds than the 8800 GTS. Will that be enough to knock Nvidia off its perch? Let's find out.

—MICHAEL BROWN

GEFORCE 8800 GTS
Leadtek WinFast PX8800 GTS
$250, www.leadtek.com

ROUND 1

GAMING

Despite being outgunned in stream processors (the 8800 GTS has just 128 to the HD 3870's 320), Nvidia clobbers AMD in gaming performance—especially when playing Crysis at high resolutions (1920x1200 with 2x AA). The key is Nvidia's ability to clock its shaders independently of the chip's core clock speed: The core is clocked at 650MHz, but the shaders hum along at 1.625GHz. If gaming is your primary reason for upgrading your videocard, there's absolutely no doubt that the 8800 GTS is the champ in this round.

Winner: GeForce 8800 GTS

ROUND 2

MOVIES/HOME THEATER

PC users don't live by gaming alone. We also depend on our videocards to deliver movies—the ones we create ourselves and the ones that Hollywood produces for us. Both cards are capable of offloading 100 percent of the decoding chores from the host CPU, even for Blu-ray discs, but we much prefer AMD's audio solution: The HD 3870 has an integrated audio processor that enables the card to output Dolby Digital surround sound (5.1 channels) to a DVI-to-HDMI adapter. The 8800 GTS requires a separate cable.

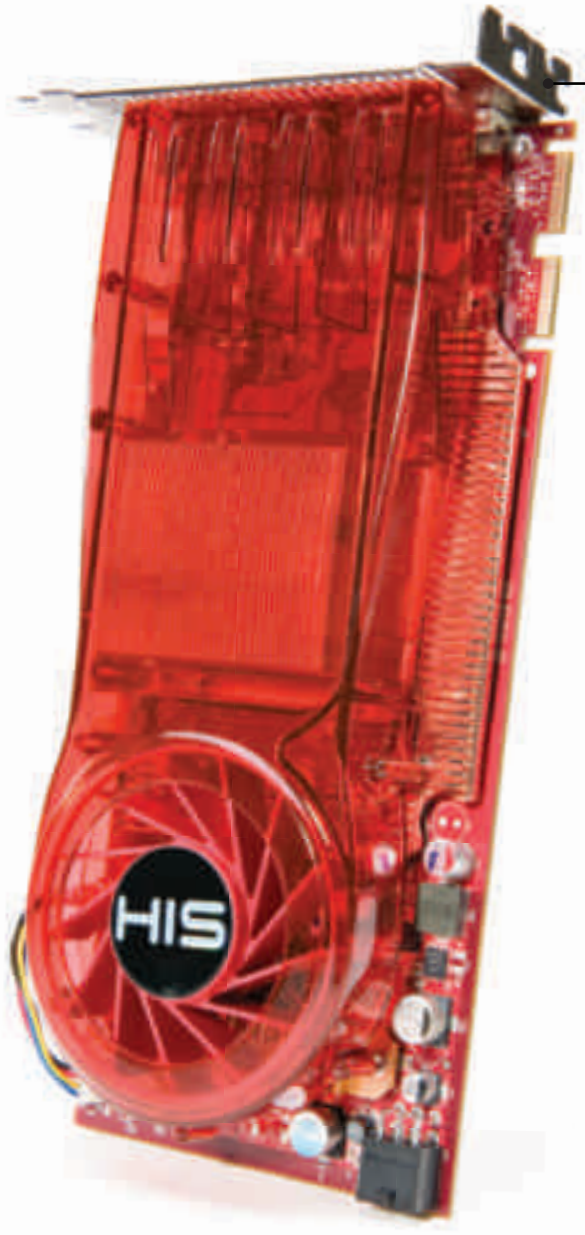
Winner: Radeon HD 3870

ROUND 3

DUAL-GPU PERFORMANCE

AMD's CrossFire and Nvidia's SLI enable you to increase your rig's gaming performance by installing multiple GPUs. Both companies, however, require you to use a motherboard outfitted with *their* chipsets (although you can run dual AMD GPUs on certain Intel chipsets). This constraint is entirely artificial, of course, and there is no legitimate reason you shouldn't be able to put a videocard into every PCI Express x8 or x16 slot on whatever mobo you own. For that, we cast a pox on both their houses! The fact that Crysis running on Windows XP doesn't scale at all in CrossFire mode, on the other hand, gives Nvidia the win in this round.

Winner: GeForce 8800 GTS



RADEON HD 3870
HIS H387F512N
$175, www.hisdigital.com

ROUND 4

OVERALL PRICE/PERFORMANCE RATIO

As we went to press, the Radeon HD 3870 was selling for $75 less than the GeForce 8800 GTS—that's a 30 percent difference. But the gulf between the competitors' gaming performance—and games are the primary reason you'd be considering either of these cards—is even wider. In single-card mode, the 8800 GTS was nearly 60 percent faster than the Radeon when playing Crysis, and it was 72 percent faster in dual-card mode. The Radeon HD 3870 is cheap, but the GeForce 8800 GTS completely justifies its price premium.
Winner: GeForce 8800 GTS

BENCHMARKS

	HIS Radeon HD 3870 (single)	Leadtek GeForce 8800 GTS (single)	HIS Radeon HD 3870 (dual)	Leadtek GeForce 8800 GTS (dual)
WINDOWS XP				
3DMark06 Game 1 (fps)	23.4	**29.2**	38.2	**52.6**
3DMark06 Game 2 (fps)	20.9	**22.3**	29.1	**40.7**
Crysis (DX9) (fps)	11.8	**19.6**	11.8	**27.0**
Unreal Tournament 3 (fps)	60.9	**78.9**	83.7	**113.0**
WINDOWS VISTA				
3DMark06 Game 1 (fps)	22.8	**27.6**	42.1	**53.0**
3DMark06 Game 2 (fps)	20.6	**21.5**	30.6	**41.1**
Crysis (DX10) (fps)	10.5	**19.5**	**16.5**	WNR
Unreal Tournament 3 (fps)	56.3	**70.4**	WNR	**75.4**

Best scores in single- and dual-GPU mode are bolded. AMD-based cards are tested with an Intel D975BX2 motherboard; Nvidia-based cards are tested with an EVGA 680i SLI motherboard. Intel 2.93GHz Core 2 Extreme X6800 CPU and 2GB of Corsair DDR RAM used in both scenarios. Benchmarks performed at 1920x1200 resolution on ViewSonic VP2330wb monitors.

And the Winner Is...

Before we get to our conclusion, we have to bring up the matter of Vista performance. We've been running these benchmarks under both Vista and XP for quite some time without any problems. After we installed Vista Service Pack 1, however, our Crysis benchmark crashed on our Nvidia test bench in SLI mode, and Unreal Tournament 3 crashed on our AMD system in CrossFire mode.

Aside from that, this wasn't much of a contest: The Radeon HD 3870 is the far superior videocard when it comes to home-theater applications—but you don't need a GPU this powerful for watching movies. Any of the lesser GPUs in AMD's Radeon HD 3000 line would be just as good for that purpose—buy one that can be cooled passively and avoid the noise a fan will produce.

The GeForce 8800 GTS delivers far superior gaming performance in both single- and dual-GPU modes, and it can also handle HD-video decoding. Yes, cards based on this GPU are considerably more expensive than those built around AMD's offering, but the increased performance fully justifies the higher price tag.

Our consumer advocate investigates...

Sub300's Subpar Service

RegCure

An Empty Food Bowl

Sub Service

Dog, some months ago, I bought an inexpensive Linux-based PC from Sub300.com, which was selling older stock to make room for new inventory. I purchased model #13338, which had an AMD Athlon XP 3100+ and 256MB of RAM. The configuration didn't bother me, as I figured I could upgrade it with parts from eBay. The machine was discounted from $165 to $129. With shipping it was $159. When I received the PC, the configuration wasn't even close—the CPU was an AMD Athlon XP 1400+. I contacted Sub300.com and informed them of the mistake. They admitted that an error had been made and that they would work on their end to fix it. I shipped the PC back at the cost of $48.35 and sent the company the tracking info.

The company said a new machine was being prepped for me. Of course, the company stopped responding after that. I have emailed the company twice, asking for a tracking number, but they have not responded. There's no answer when I call. I bought the PC with my debit card, which doesn't let me dispute any charges after a month. Am I out the $159 that I paid for the computer? I don't care about what I had to pay to ship it back—mistakes are made. I'm human, I make them too.

—Glenn Condrey

The Dog looked at Sub300.com's website, and it immediately raised some concerns. After all, the Dog doesn't know of too many PC vendors that also sell bottled water and boast of operating three SilverStar car washes in the Ontario area; on the other hand, the company is the official car wash of the Toronto Raptors, so it must be legit, right?

When contacted by the Dog, David Silverman, president of Sub300.com, apologized for the problem and said that it occurred at the company's shipping facility, where the labels on two machines were reversed and then sent out. "Each customer received the other's computer by honest mistake," Silverman said. "Each customer agreed to return the wrong computer, so we could make things right and resend them out properly," he added. "We have already given instructions to Glenn and authorization for a full refund/credit to his credit card, and we apologized profusely to both clients.

"Clearly [the mix-up] was an error, compiled with a little bit of bad communication, that was ultimately resolved to the full satisfaction of both customers," said Silverman, who added that although Sub300.com might not seem like a big company, it does $75 million in sales annually, albeit with a staff of 10 people.

The Dog checked with Glenn, who said he was indeed promptly issued a refund after the Dog spoke with Silverman, but the story doesn't quite end there. Glenn said that after he returned his machine to Sub300.com as instructed, apparently no one picked it up. The post office eventually returned the package to Glenn, who has no idea what to do now.

"I want to do the right thing here, but the idea of spending $48.35 again and not receiving full reimbursement makes me kind of antsy. On the other hand, I do not want something I did not pay for," he told the Dog.

At press time, the Dog was in the process of contacting Sub300.com to see if the company would be willing to pay the shipping costs for Glenn to return his system a second time. Woof.

RegCure reported problems with a completely new install of Windows XP.

Is RegCure a Wonder Cure?

I recently downloaded RegCure software, but I have to buy the full version of the app for a complete system repair. Is RegCure.com a reputable company?

—Ted Keenan

That's a good question, Ted, as a few things about RegCure.com certainly seem suspicious, including a slick-looking website with no phone number in sight and a product that's being pimped all over the Internet by websites that some would regard as shady. Despite that, RegCure and the maker of the software, ParetoLogic, are real. The company employs 110 people and is a member of the Software Information Industry Association.

RegCure was reviewed and recommended by *Financial Times* tech writer Paul Taylor, who said he preferred the software over Registry Mechanic 5.2 because "...it has additional features, including the ability to manage the programs

that launch when Windows fires up."

The Vancouver Island branch of the Better Business Bureau also gives ParetoLogic a thumbs up and notes that the company has been in business since 2004 and is an accredited BBB member. The BBB says that although the company has logged 47 complaints within the last three years (with 26 of those coming in the last 12 months), the company has satisfactorily addressed all of the issues. If it didn't, the company wouldn't be accredited by the BBB.

So everything's fine, right? The Dog isn't sure. A search for user experiences on the Internet reveals some pretty pissed-off customers. At Complaintsboard.com, the overwhelming opinion is that RegCure has a tendency to break things rather than fix them, with many people reporting that they had to perform a system restore to get their machines working after using the software. RegCure itself claims to fix corruption problems with registry keys and classes, remove invalid DLL entries, and clear empty registry keys. It also says that it fixes program shortcuts, lets you manage Windows startup items, and backs up the registry for you.

The Dog decided to give RegCure a spin, so he installed it on a clean copy of Windows XP Professional with the newly released Service Pack 3 integrated. The version was newly created in Virtual PC 2007. Could there possibly be problems with a clean install of XP? According to RegCure, yes. The software found 335 problems related to COM/ActiveX entries, application paths, and file/path references, and 199 empty registry keys. Curious to see if another registry repair utility would find as many problems, the Dog reverted to the original install and gave the freeware Crap Cleaner a spin. Although more of a decrufter, Crap Cleaner also features a registry scanner. On the clean install, Crap Cleaner found 12 problems and, of course, offered to fix them for free.

COULD THERE POSSIBLY BE PROBLEMS WITH A CLEAN INSTALL OF XP? ACCORDING TO REGCURE, YES.

Thinking the issue might possibly be with Service Pack 3, the Dog created a new virtual machine using a Windows XP CD provided by Microsoft. The disc holds the original 2001 version of XP Pro and does not feature any patches or service packs and is limited to the native driver support that XP uses. Crap Cleaner again found 12 issues with the original XP. RegCure found 318. So you do have to wonder what exactly the program is finding.

The Dog asked ParetoLogic about the complaints and problems that RegCure found. "RegCure is a logic-based program that looks for specific registry inconsistencies. Each check box applies a different type of logic to identify issues. Without seeing the results of your scan, our best guess is that the majority of the results are related to empty registry keys. Since the registry is just a database and a program can use it in any fashion it chooses, occasionally our logic detects false positives. We do have a whitelist to mitigate and avoid such issues, and we regularly update it to include any false positives that we have found," said Amanda Cooper, a spokeswoman for ParetoLogic. She said the company is waiting for SP3 to be released before doing a full round of tests with it. Cooper said she understands the Dog's concerns regarding the large number of negative comments and said the company has been going to forums to answer questions and offer support if required.

"I regret the frustration and difficulties that consumers experience with their registries, and while I respect the feedback in online posts about registry cleaners in general and RegCure in particular, I am fortunate to see all the testimonials that come in daily from our customers, so I do know that it is a product that computer users are finding effective and useful," Cooper said

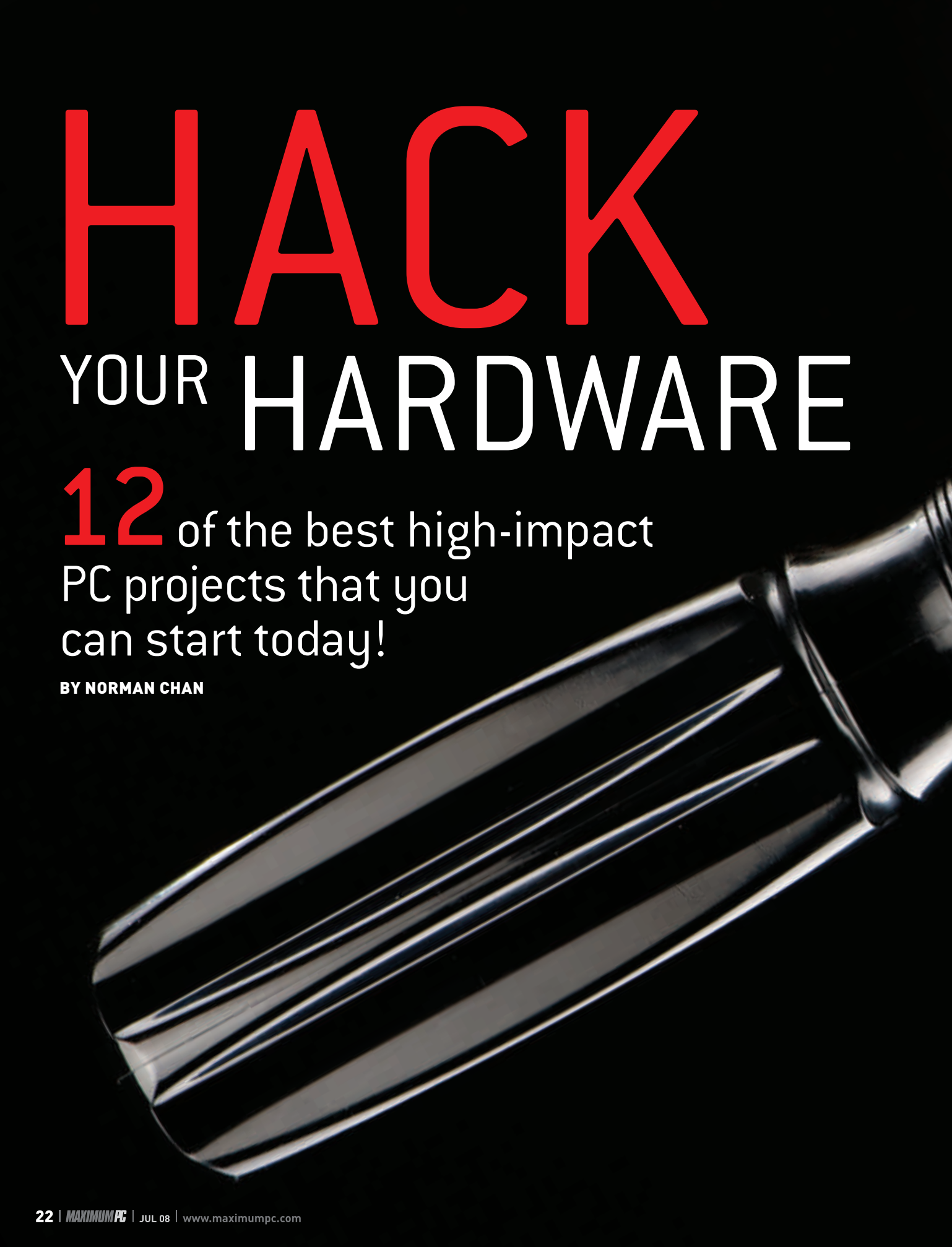
What's the Dog's take? At this point, the Dog isn't convinced that *any* registry cleaners actually work, as he has never known them to actually improve performance. This isn't just RegCure, but registry scanners going back through the years. Though some of the marketing for RegCure may be questionable, ParetoLogic is certainly real. What's your take? The Dog would like to hear. Woof.

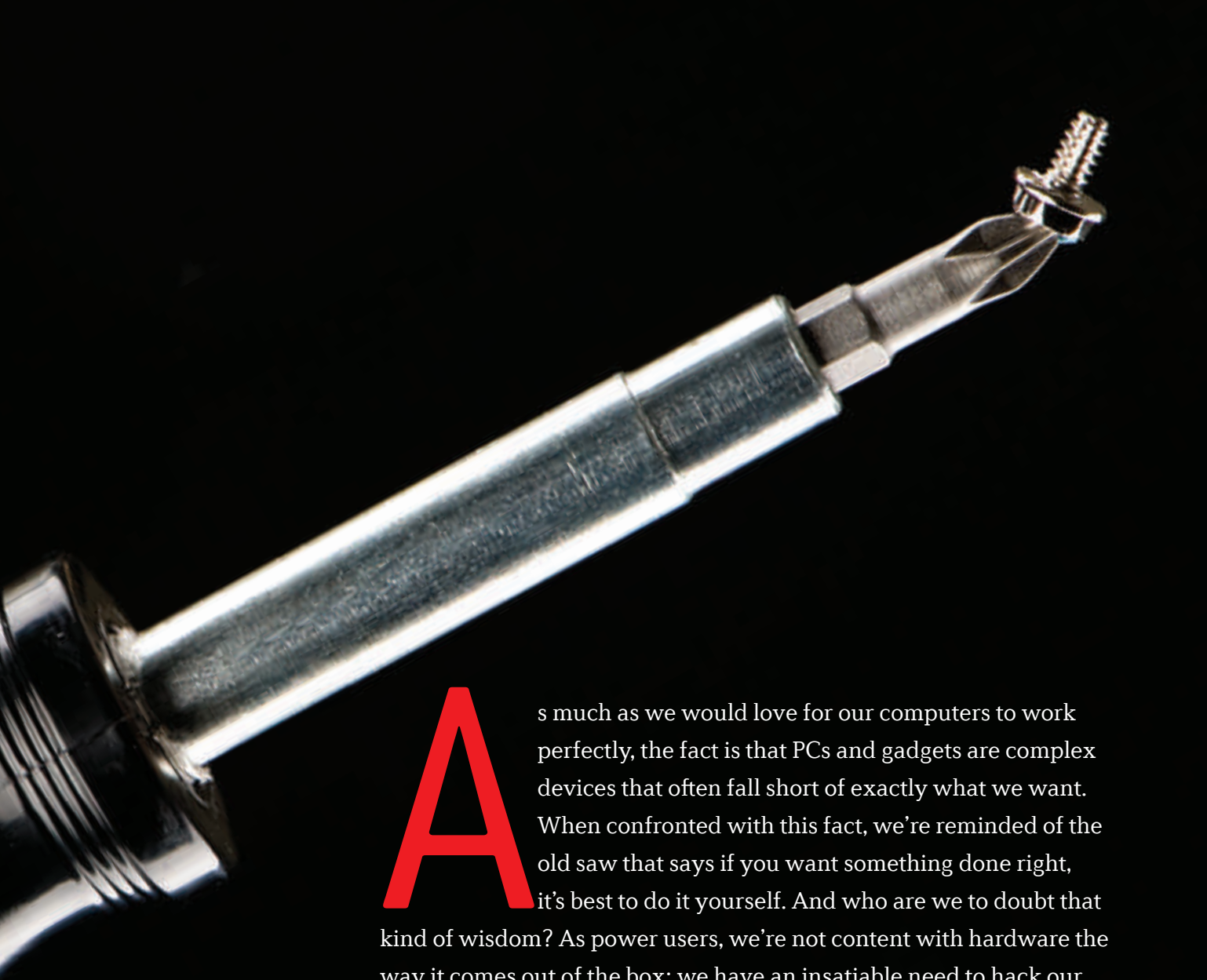
EMAIL THE WATCHDOG If you feel you've gotten a raw deal and need assistance setting a vendor straight, email the Dog at watchdog@maximumpc.com. Please include a detailed explanation of your problem as well as any correspondence you have sent concerning the issue.

HACK YOUR HARDWARE

12 of the best high-impact PC projects that you can start today!

BY NORMAN CHAN



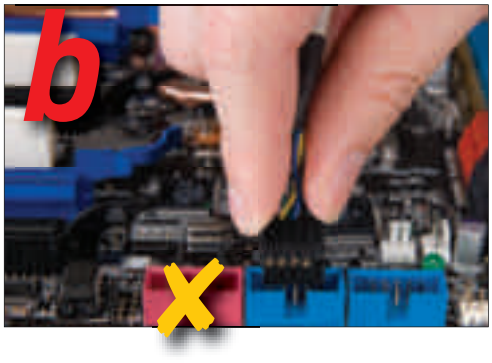


As much as we would love for our computers to work perfectly, the fact is that PCs and gadgets are complex devices that often fall short of exactly what we want. When confronted with this fact, we're reminded of the old saw that says if you want something done right, it's best to do it yourself. And who are we to doubt that kind of wisdom? As power users, we're not content with hardware the way it comes out of the box; we have an insatiable need to hack our electronics in ways that will improve performance, functionality, and ease of use. And there's no doubt about it, modifying your hardware will increase your productivity and make your life that much simpler.

The following pages contain a wide selection of hardware projects, ranging from novice-level tweaks to expert-only operations. From cable management and case mobility to LED soldering and firmware upgrades, each of these useful hacks has been tested and verified for effectiveness. Still, you'll definitely want to read through our step-by-step instructions completely before starting, to avoid any mishaps. If you're prepared to accept the risks—possibly voiding warranties and damaging your hardware—your efforts will yield some sweet rewards. So let's get hacking!

NOVICE
Add a Media Reader to Your Case

The floppy disk is dead—we all know that. Yet so many modern computer cases still sport 3.5-inch drive bays that are just begging to be used. Enter the internal media reader. The device not only spruces up your front panel but also gives you a convenient way to deal with today's plethora of flash memory formats.



We chose Sabrent's 52-in-1 Multi-Card Reader ($14, www.newegg.com) because of its wide range of supported formats and easy installation. Sporting four memory-card slots along with an extra USB port, this minimalist-looking USB 2.0 reader will let you transfer your digital photos, music, and data at a blazing 480Mb/s.

Installing the media reader is simple. First, remove the front panel from a free 3.5-inch drive bay on your system chassis. Open up your case's side door and slide the reader into the bay until it's completely flush with the entire front panel (image A).

Next, take the internal USB adapter and plug the head into an available nine-pin USB port on your motherboard (image B). *Don't* plug the head into a similar-looking FireWire port, which could damage both your motherboard and drive. USB and FireWire ports are usually color-coded, but refer to your motherboard manual to be sure. The media reader is powered by USB, so it doesn't need an external power source.

Windows XP and Vista will automatically detect the media reader upon restart and assign drive letters to its ports. If you're building a system from scratch, connect the media reader after you've booted into Windows to avoid accidentally assigning the "C" drive letter to a flash reader.

JOURNEYMAN
Soundproof Your Case

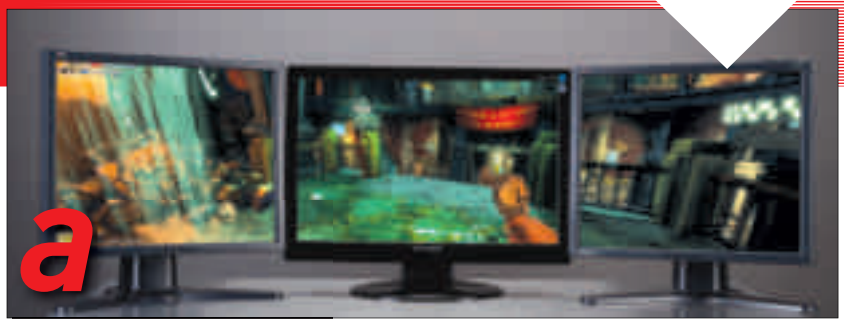
Noisy fans and rattling disk drives can be a nuisance, especially if you regularly leave your system powered on overnight. Short of confining your PC to a closet, the best (and most practical) sound-dampening solution we've found is to apply sound-absorbing foam to our case's side panels (on the inside, of course). Acoustic PC (www.acousticpc.com) sells dual-layered foam sheets ($50 for a three-pack) that can easily be adhered to case interiors for priceless peace and quiet. The panels are just 7mm thick, which is convenient for densely packed systems where space is limited.

First, measure the dimensions of your case's side panels. If a fan is permanently attached to the side panel, create a paper template based on the fan's dimensions and trace that shape at the appropriate place on the foam.

Cut a sheet of sound-dampening foam based on your measurements. Excess material can be used to line other locations, such as the floor or ceiling of your case; just be careful not to cover any ventilation holes or high-heat areas, such as the power supply.

To apply a large sheet of foam, start from one corner of the panel and slowly move to the opposite end. Press the foam firmly against the panel while slowly removing the thin plastic sheet protecting the self-adhesive gum with your other hand. Avoid creases and air bubbles by peeling and progressing patiently.

EXPERT
Rock a Triple-Monitor Setup



[redacted]ave multiple outputs offering sup-[redacted]ors simultaneously, but no more [redacted]ing up on desktop space is great for productivity, it's insufficient for "surround-screen" gaming, which requires stretching games to three monitors (image A).

There are a couple different options for running a triple-monitor setup. Some new monitors, such as Samsung's 940UX, actually have USB input support, nixing the need for a traditional videocard completely. A special display chip inside these monitors compresses high-resolution video (up to 1600x1200) to fit through USB 2.0's 480Mb/s bandwidth spec. However, high latency and a lack of 3D support (video acceleration is emulated via software) make this route untenable for gaming, not to mention most other power-user practices.

TRIPLE-MONITOR TITLES

The following games natively support three screens:

- Flight Simulator X
- BioShock
- Supreme Commander
- Sins of a Solar Empire
- ArmA: Armed Assault

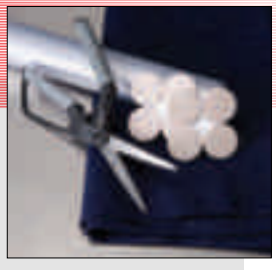
Another option is Matrox's TripleHead2Go, an external video adapter that allows three monitors to be connected to one videocard output (either VGA or DVI) for a maximum resolution of 3840x1024. Since your graphics card is fooled into thinking that it's connected to one really wide monitor, gaming across three screens is seamless. The downside to this $330 solution is that your start menu will always be on the leftmost monitor and maximizing a window will stretch it across all three displays. You'll also need a beefy videocard to single-handedly render games at ultra-high resolutions.

The most practical way to run three monitors at once is to just install a second videocard. If you have a modern motherboard, we recommend that you use two PCI Express videocards, since the limited bandwidth of PCI lanes will prohibit triple-monitor gaming. We also recommend that both videocards be of the same brand to avoid compatibility issues, although ATI and Nvidia accelerators will likely play nice with each other if you use the most recent display drivers.

With three monitors plugged into two videocards, Windows will automatically treat each monitor as an independent controllable desktop. Via Display Properties, you can manipulate each screen's resolution, orientation, and po[redacted]ry about which port the monitor is connected to (image B). Many games will recognize a triple-monitor setup and [redacted] resolutions, but one trick to running any game across three screens is to play it in a stretched window. This helps avoid pixel alignment problems when you're using different-size monitors—you'll want to adjust "field of vision" settings in first-person shooters if possible to give you the right perspective (we suggest setting the FOV value to 180).

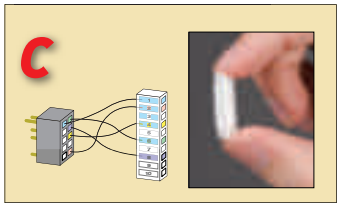
If your monitors use different resolutions, getting a cohesive background across all three screens is a little bit tricky. Windows only lets you either stretch one large wallpaper across your screens or clone an image across all desktops, neither of which produces a satisfying result. To create a tri-monitor-friendly wallpaper, you'll need to create a test image to help you unscramble your monitor arrangement. Using an image editor, mock up a template that matches the combined resolution of all three displays, color-coding the left, middle, and right sections of the image for reference (image C). Save and set this template as your background and note any alignment problems—for example, the wallpaper starting at your center monitor as opposed to the leftmost one. In the image editor, tweak the template until it displays all three monitor sections correctly as your wallpaper. After working out the alignment kinks, drop your desired images over the template to create your three-screen background.

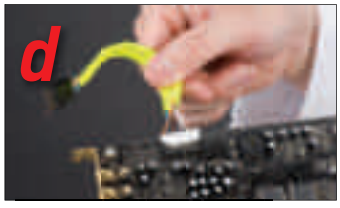
NOVICE
Make Your Case Moveable



Sliding your case out from under a desk shouldn't be a chore—nor should it permanently damage your hardwood floors. The solution is to apply strategically placed felt pads to the bottom of your case. For cases with four plastic feet, you can attach circular felt pads to each foot for guaranteed protection. We found an eight-pack of heavy-duty self-adhering pads for $4 at a local hardware store. You can also buy sheets of felt to cut to your own specification—for use with a case that has rails instead of feet, for example, such as Cooler Master's Cosmos. On carpeted floors, we like to place our system on a sheet of plastic counter lining ($5 at Home Depot) for an easier slide-out.

EXPERT
Connect Your X-Fi to a Front-Panel Connector





Integrated audio has come a long way since its dodgy beginnings, but we still can't resist the aural lure of Creative Labs's X-Fi soundcards. The problem is that these cards don't have the appropriate plugs to accommodate the front-panel sound ports on most new cases. X-tap.com sells adapters for $30, but it's also possible to make your own X-Fi harness to maximize acoustic accessibility.

We found all the necessary parts for less than $10 at Digikey.com (image A): a white 10-position, 2mm connector (part no. 455-1151-ND) that snaps into the top of the X-Fi soundcard, small terminal connectors (part no. 455-1127-1-ND) that fit into the white connector, a black connector housing (part no. WM2522-ND) that'll connect to the case's front-panel audio connectors, and at least five long terminal connectors (part no. WM2515-ND) that go into this black housing block. The wires themselves can be harvested from an old Ethernet cable. You'll also need a pair of needle-nose pliers and a set of wire cutters.

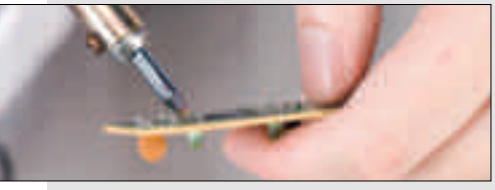
Cut a five-inch section of network cable and separate out five individual wires. Strip 2mm of insulation from each end of the wires and carefully crimp one of each connector type (long and short) on either end of each wire (image B).

Now, with the white 10-position connector oriented as shown (image C), insert the wires via the small-connector end. If done properly, the small metal tab on the connector should lock into place when pushed deep enough. You'll want to insert wires into positions 1, 2, 4, 6, and 8, leaving the other slots empty. Position 1 is ground, 2 is headphone left, 4 is headphone right, 6 is mic input, and 8 is the voltage for the microphone. Now follow the diagram to insert the long-connector end of the wires into the black housing (image C). Wrap some tape around your wires to create a finished cable (image D).

If your case uses a front-panel audio connector that's individually wired and labeled, matching the five connectors should be easy. Make sure that each wire is insulated from the others with some electrical tape to prevent shorting out your X-Fi. If your case's front-panel audio connector is a black housing block corresponding to AC'97 or HD audio specs, refer to http://tinyurl.com/47olau for details on how to correctly arrange the prongs in your black housing block to match the front-panel one.

EXPERT
Replace Blue LEDs

We're feeling so inundated by all the blue LED lighting emanating from our PC peripherals that we're starting to long for the green LEDs of yore. Whatever your color preference, it's possible to swap out the LEDs on any device. We demonstrate with an old keyboard, but this technique applies to optical drives and cases as well. You can find replacement LEDs of various sizes and colors at your local Radio Shack.



To access the original LED, remove all the screws from the back of the keyboard and remove the small circuit board housing the LED (it should be the only circuit board in your keyboard). Using a soldering iron, heat the solder on the back of the board and carefully pull out the old LED.

When you replace an LED it's important that the polarity on the LED and board are matched. Most boards will have +/- indicators printed on them, and the longer leg of your new LED should align with the positive, or cathode, side. You can also test the polarity by carefully touching the LED's wires to a 9-volt battery to see which orientation produces light.

Apply a little solder to your iron and carefully solder the new LED from the back of the circuit board. Trim the legs of the LED with a pair of cutters and make sure they're not touching. Repeat the steps for any additional LEDs you want to change, and then reassemble the keyboard.

JOURNEYMAN

Upgrade Your Linksys Router

Navigating through a router's multitude of menus and configuration settings can be confusing, especially given the obtuse documentation typically bundled with the device. That's why we prefer third-party open-source firmware, which not only streamlines a router's graphical user interface but also adds robust functionality. For Linksys routers, our firmware of choice is Tomato (www.polarcloud.com/tomato). As with all third-party firmware upgrades, installing Tomato does come with a slight risk of damaging your router. While we've never had any problems with this software, it'll definitely void your router's original warranty.

First, verify that your router is compatible with Tomato. Older WRT54G and WRT54GS models (versions 1 to 4) will work, as will all versions of the WRT54GL series, which we recommend (image A). A list of compatible routers is on the Tomato website. D… …est …ack

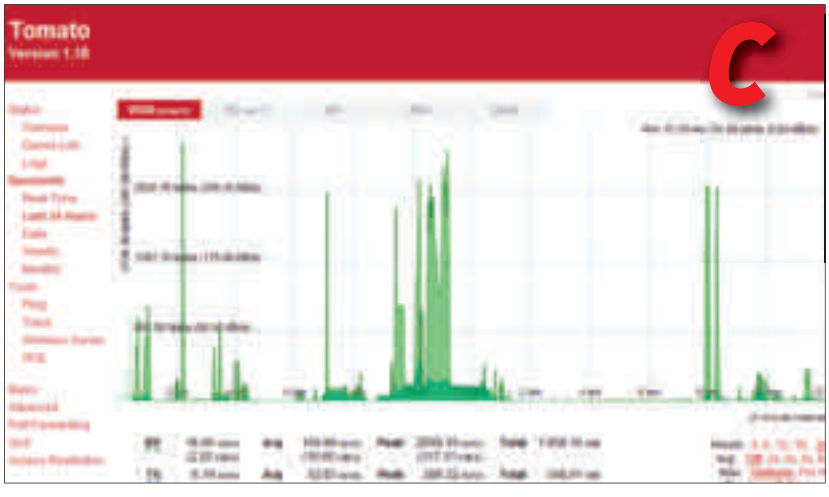
Access your router's …ternet …ult IP is …lick the …b. Under Firmware Upgrade, browse to the unpacked firmware folder and pick the matching firmware type—the Tomato package includes different versions of the firmware for different Linksys router models. Hit Apply and wait while your router's firmware is flashed. Don't disconnect power to the router during this upgrade.

Once the upgrade is finished, go back into the router configuration and you'll be greeted with the new interface. If your previous username and password don't work, try using "admin" (without the quotes) in both forms to get in. We recommend using Firefox to access the GUI to enable all of its features. The newest version of Tomato automatically migrates all of your router settings so you don't have to reconfigure your network.

To boost your router's wireless signal, go to the Advanced menu and select the Wireless section. From there, you can adjust the router's "Transmit Power" value to any number between 1 and 251 (default is 42). We don't recommend setting a value higher than 70, since sending stronger signals can overheat the router (image B). From this menu, you can also adjust the maximum number of wireless clients and the transmission rate of your wireless network.

Within the Bandwidth menu, you'll find access to bandwidth monitoring, which lets you scrutinize traffic usage for every wired or wireless connection to your router (image C). Combine this information with the new Access Restriction options and you'll be able to ensure that your kids aren't playing World of Warcraft in the middle of the night.

Enabling Quality of Service mode (under the QoS menu) will let you prioritize traffic going through your router depending on the size of data packets and network protocol (i.e., http vs. ftp). Sorting QoS Classification is a complicated process, so you should refer to Tomato's online documentation to find out what …opriate for your …



…rn your router into …bridge, which lets …etwork hub for de…less network cards, …60. Under Basic Network settings, scroll down to Wireless Mode and select Wireless Ethernet Bridge. Under SSID and Security, enter the name and network key for your wireless network. With these settings saved, you can plug wired devices into the bridge and tap your home's wireless network—perfect for streaming movies!

NOVICE

Use an Old PDA as a Second Monitor

With the improved productivity software on smartphones and the iPhone, there's almost no reason to have a dedicated PDA that you can't also make calls on. Of course, that leaves early adopters who bought Dell Axims and HP iPAQs in the great PDA surge of 2000 with pricey and plenty of remorse.

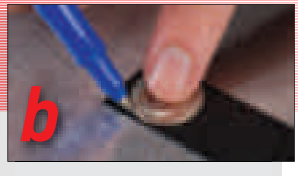
That is, unless you put that old PDA to use in some other fashion. You ca turn the device into a secondary monitor. Any PocketPC/WindowsCE PDA t soft's ActiveSync software can be reprogrammed to serve as a desktop extension to give you just a little more screen space (image A). To do this, we used a program called SideWindow, ($15, http://tinyurl.com/2pyuj8).

Installing the app is just a matter of connecting your PDA to its cradle, launching ActiveSync, and running the SideWindow executable. With the program installed, we launched its configuration utility and adjusted the display resolution (image B). Most PocketPCs have a native resolution of 240x320, but SideWindow can scale a virtual resolution of up to 768x1024 to fit your screen. Our Dell Axim X50v actually has a native resolution of 480x640, but we found that anything above 300x400 made text very difficult to read.

Windows treated our PDA like any other monitor, so we could arrange it to either the left or right of our primary display and extend our desktop accordingly. Since the hack runs display information over USB, there can be a bit of lag when moving objects around in the new window—we don't recommend watching video on the PDA screen! SideWindow is best for keeping tabs on buddy lists or cheat codes when playing games, hosting to-do lists, and displaying media player information when running a movie at full screen (just drag the desired windows over to the new screen).

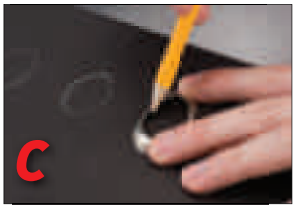
JOURNEYMAN

Silence Your Hard Drives



Aside from your CPU fan, one of the noisiest components i Spinning platters can rattle the drive t. Some cases, such as Cooler Master's hard drive racks that already sport r but adding some of your own is fairl rubber washers are effective at cushioning a drive and taming its noise output. Hardware stores sell rubber washers fairly cheaply, but in our experience the premade variety are often either too thick or [redacted]ameter for tiny hard-drive-cage screws. So we make our own rubber washers by cutting them out of thin rubber strips. A roll of linerless rubber splicer tape will do the job and is availa op. Use a dime as a stencil for your washers and trace and cut several circles from the tape (image B). The rubber liner tape is 0.03 inches thick, so you should stack two washers to create an effective dampener. Cut a small hole in the middle with a knife or tiny hole-punch (image C). Affix these washers between the hard drive and the mounting rack of your case (image D). The rubber washers serve as a buffer between the metal of your drive and case to prevent noise from reverberating through the case.

JOURNEYMAN
Create a Charging Station



Just because you're a gadget junkie doesn't mean you have to be a sloth. We know that managing the power cords for your PDA, cellphone, MP3 player, and digital camera can create a tangled mess on your desk, so we've devised a way to keep your chargers elegantly organized to avoid scaring off the ladies (image A).

For this project, you'll need a sizable box that can fit a power strip, heavy-duty scissors or a cutting blade, some craft glue, some small decorative frames, and the aforementioned power strip (image B). We picked up a nice-looking storage box from a craft store, but a plain shoe box will do if you don't care about aesthetics. We also bought our tiny decorative frames from a craft store. We'll use these to stylize the ports of our charging station—just keep in mind that each hole has to be large enough to fit at least one end of your charging cable.

Using a metal frame, stencil several holes on the lid of the box, where the charging cables will eventually emerge (image C). Also stencil a hole on the side of the box for the power strip's power cable. Using the markings as a guide, score the box with a sharp blade. The box we bought was pretty thick, so it was impossible to cut through with one pass. Instead, we glued the frames on top of the scored areas before making deeper cuts to punch out the holes—the frames help guide our cuts and hide any imperfections.

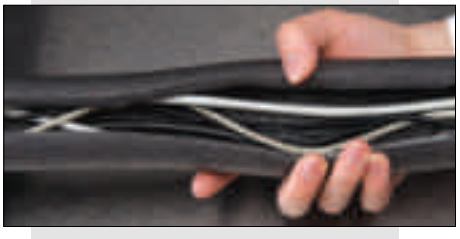
created, plug your gadgets' chargers into the power strip. You ıp the cables for each charger with a zip tie as well, so cords aren't tangled with each other in the box (image D). String the other end of each charger through a hole. For USB-powered devices, we plugged a generic powered-USB hub into the power strip (Belkin sells one for $20) and wired USB cables through the box lid.

With the box finished, you can accent it with stickers or labels to match your desktop setup.

NOVICE
Stealth Your Cables

The unkempt mess of cords and cables under any power user's desk is a horrific no-man's-land of dust and disarray. The easiest way to sheathe and organize computer cords is to use foam pipe-insulation. We found a 6-foot-long tube at a local hardware store for less than $2!

Start by deciding which cables to bundle together. Power cables should never be bundled with audio or video cables, since AC current distorts sound and video signals. We recommend grouping your USB and peripheral cables, your power and network cables, and your speaker cables separately.



Measure and cut off a section of insulation tube that's long enough to house your cables while leaving about a foot of slack at each end. Some tubes are precut or perforated along their ridges, while others will have to be sliced open like a hot dog bun. Lay the bundled cables down along the length of the foam tube. When you release the walls of the tube, they will envelop the cables, keeping them out of sight.

The great thing about these tubes is that the cables can "exit" at any point, so they don't all have to come out at one end. Use some strong tape or staples to affix the tube underneath your desk. Who knew cable management could be so easy?!

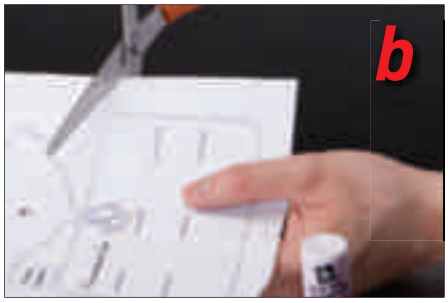
JOURNEYMAN
Make a Wi-Fi Extender

Plagued by unreliable Wi-Fi connectivity? We've found a cheap and relatively easy way to boost a wireless router's signal strength by creating a simple parabolic reflector dish to direct Wi-Fi signals to your intended receivers.

some paper, foil, scissors, glue, and a cutout template that w.freeantennas.com/projects/template2/ (image A). This a design focuses your router's signals in one direction, which not only helps increase your signal by about 10dB but also improves your wireless privacy by reducing the amount of stray signal headed toward nosy neighbors.

sheet of regular paper. You can actually scale the image to a larger size—while maintaining the relative dimensions—for a stronger focus. First, cut out th , then use a glue stick to affix foil to the front of each piece. Use a knife to make cuts on the indicated slits and bend the reflector to fit the six tabs into the respective holes.

Slide the booster over the existing antenna of your router and point it in the desired direction (image C). Your results may vary depending on the build quality of your reflector, and making two dishes will give you better boost if your router has two antennas. Use a free network-performance measurement tool such as NetStumbler (www.netstumbler.com) or Qcheck (http://tinyurl.com/3csl3l) to test your router's throughput.

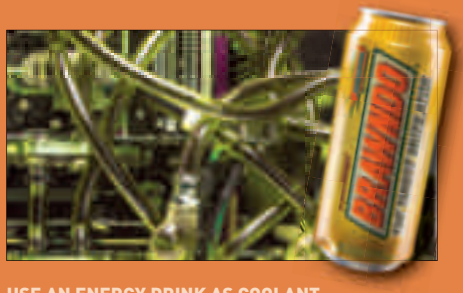


Half-Baked Hacks

Here are a few hacks that didn't sound viable on paper, and would probably be supremely

WALL MOUNT A CRT
In the future, we'll all be using wall-mounted displays for convenient viewing-angle adjustment and an ultra-sleek look. But we'll all be using LCD displays, as well. That's why wall-mounting a CRT not only looks obnoxious but is also probably the quickest way to tear a hole out of your wall. Never mind that CRTs don't have mounting holes on their backs, their forward-heavy weight would snap off any mounting arm before you could finish screwing it in.

UPGRADE YOUR OPTICAL DRIVE'S LASER
Craving the glorious visual fidelity of high-definition movies but don't have the budget for a Blu-ray drive? Maybe replacing the red laser diode of your standard DVD player with a blue LED will do the trick. You wish! Hacking your optical drive's laser isn't just inadvisable—it simply won't work. Sorry, Charlie.



USE AN ENERGY DRINK AS COOLANT
Brawndo's got electrolytes. What are electrolytes? We're not sure, but they're extremely awesome. And they're what CPUs crave. They crave electrolytes. And Brawndo is full of them. And that's why CPUs crave Brawndo. Not water, like from the toilet. We've never seen CPUs cooled in a toilet. Get Brawndo—the CPU Thirst Mutilator! Not!

INTEL CORE-LOGIC CAGEMATCH

Four new high-performance motherboards representing the latest and greatest Intel chipsets fight for the right to house your Penryn CPU

BY GORDON MAH UNG

It pays to be an Intel fan these days. You have not only the supremely powerful Penryn CPU in your corner, but also a host of performance-oriented, feature-packed motherboards to choose from. Contributing to the bounty are two recently released enthusiast core-logic chipsets—Intel's own X48 and Nvidia's nForce 790i Ultra SLI—which represent the pinnacle of LGA775 computing.

Long delayed, but much anticipated, the X48 is a sequel to Intel's impressive but short-lived X38 chipset. While the latter worked with Intel's premiere Core 2 Extreme QX9770 CPU, the X48 offers official 1,600MHz front-side-bus support. It also offers support for DDR3, PCI Express 2.0, and CrossFire X.

The 790i chipset also offers 1,600MHz FSB support, DDR3, and native PCI-E 2.0, but it diverges from X48 in its support for SLI multi-videocard configs.

Sounds fairly straightforward, but choosing a motherboard is far from simple. Even two chipsets that offer similar features can differ markedly in performance. And the variations even persist within different mobos using the same chipset. There's likely to be significant deviation between vendor A's nForce motherboard and vendor B's product. While they share the same basic core logic, the boards reflect each vendor's unique approach to leveraging the chipset's features. From the number of PCI Express slots, to the location of USB ports, to how the BIOS is written and optimized, a motherboard's design is no small matter.

That's why we've called in four of the hottest Intel-based motherboards currently available, two representing X48 and two representing 790i. We'll put these boards through their paces to determine a winner in each camp—and ultimately, the superior chipset.

Naturally, AMD fans will wonder, Where's the love? After all, AMD's performance 790FX chipset offers comparable features for its processors. Not to worry. We have reviews of two top-of-the-line 790FX motherboards at MaximumPC.com (http://tinyurl.com/5gzmns).

EVGA eForce 790i Ultra

The seven series done right

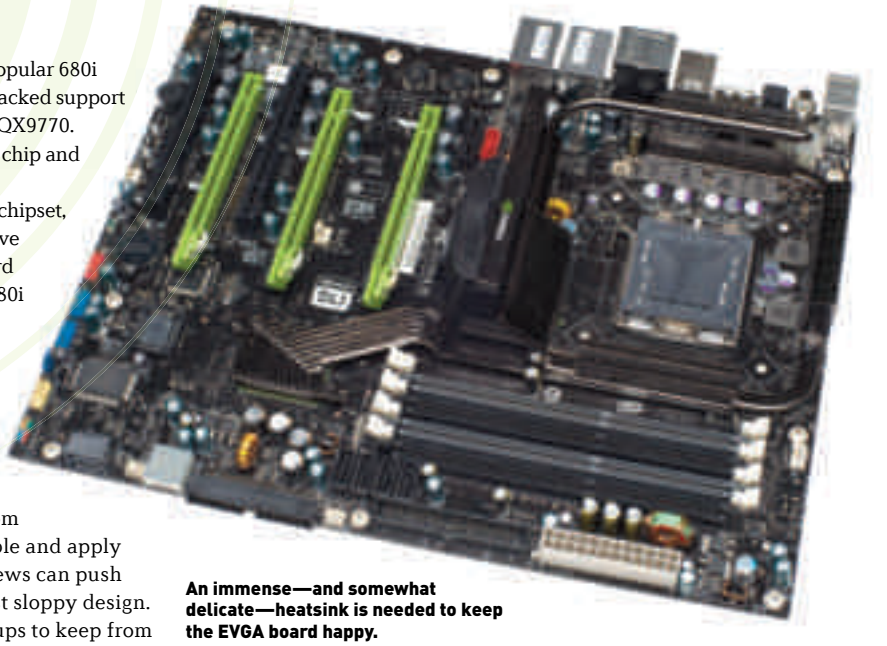
We weren't impressed with Nvidia's follow up to the popular 680i chipset. The 780i felt like a retread of the original and lacked support for Intel's top proc: the 1,600MHz FSB Core 2 Extreme QX9770. Plus, PCI Express 2.0 was simply tacked on as an extra chip and DDR3 support was glaringly absent.

Nvidia heard our complaints and created the 790i chipset, represented here by EVGA's Ultra SLI board. It has native PCI-E 2.0, 1,600MHz FSB support, and DDR3. This board even addresses another shortcoming of the 680i and 780i reference boards: lack of eSATA.

The board's physical layout is well thought out, and all the SATA ports are accessible, even with two honking dual-GPU cards installed. We're not thrilled, however, with one feature of this board (and, by extension, all Nvidia reference-design boards): The massive heatsinks are held in place with screws that protrude too far through the bottom of the board. So, if you put the board down on a table and apply pressure while installing the CPU heatsink, the screws can push forward, unseating the chipset heatsinks. That's just sloppy design. For our build, we propped the board up on Dixie cups to keep from pushing out the screws.

In performance, the board redeemed itself. It was neck-and-neck with the pricier Asus Striker Extreme II in the majority of our benchmarks, a close second to that board in memory tests, and superior in real-world gaming tests.

Heatsink screws aside, there's not much to complain about. Sure, there are boards with more luxury items, but if you want solid, bare-knuckle performance—with SLI support to boot—the EVGA 790i Ultra SLI has it.



An immense—and somewhat delicate—heatsink is needed to keep the EVGA board happy.

EVGA eFORCE 790i ULTRA
$350, www.evga.com

VERDICT: MAXIMUM PC KICK ASS! **9**

EVGA's 790i Ultra SLI board finally adds an eSATA port and keeps the legacy folks happy with both keyboard and mouse PS/2 ports.

IN FOCUS

The Facts about Chipsets and Multiple Videocards

If you have a 30-inch high-resolution display, your games may get a serious performance boost if you run more than one videocard. But know this: You'll have to choose your GPUs before you buy your motherboard because multiple Nvidia cards must run on boards that support SLI. This means you're pretty much restricted to Nvidia's nForce chipset. And that chipset will not support AMD GPUs in a CrossFire config, but Intel chipsets will. In other words, if you want to eventually run multiple videocards, don't buy an nForce motherboard and an AMD graphics card.

And another thing: While the boards reviewed here support two or more graphics cards at high speeds, not all motherboards do. Some boards have just one x16 PCI-E slot; others have an unbalanced PCI-E configuration, in which one slot runs at x16 data rates and another runs at just x4. This can impact performance, so know what you want to do before you purchase your motherboard.

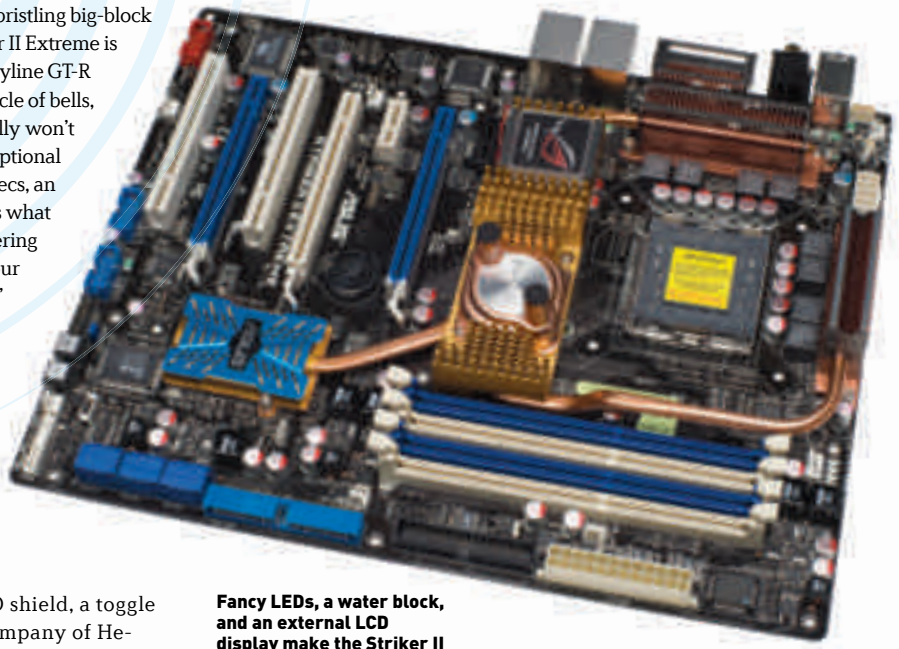
Asus Striker II Extreme

This just might be the ultimate motherboard

If the EVGA nForce 790i board is a Shelby Cobra—a bristling big-block V8 with drum brakes and leaf springs—Asus's Striker II Extreme is a high-tech, twin-turbo, all-wheel-steering Nissan Skyline GT-R R35. In other words, the Striker II Extreme is a spectacle of bells, whistles, and doohickeys. So much so that you actually won't mind shelling out $450 for it. Heck, it's plumbed for optional chipset water cooling, a riser board for the audio codecs, an externally mounted BIOS POST display that explains what the board is doing in plain English, and even a smattering of LED arrays—one, for example, lets you know if your overclocking efforts are "Normal," "High," or "Crazy."

Overclocking was clearly a factor in the Striker II Extreme's design. Of the four boards here, it produced the most impressive results, taking a 2.5GHz Q9300 up to 3.7GHz under stress with a 2GHz FSB. We were also able to push the EVGA's front-side bus to 2GHz, but we had to lower the multiplier a notch to get it to run reliably. We think we could have teased out similar performance from both boards given time, but with the Striker II, overclocking was nearly effortless.

What else does $450 buy you? A backlit I/O shield, a toggle switch to reset the CMOS, and a full copy of Company of Heroes: Opposing Fronts. In benchmark performance, the Striker traded top spots with the EVGA board in most tests, but oddly, it had the poorest scores of all the boards here in Quake 4 and FEAR. Still, given its higher overclocking scores and its plethora of value adds, the Striker II is worth the crazy money Asus wants for it, especially for hardcore PC tweakers.



Fancy LEDs, a water block, and an external LCD display make the Striker II Extreme unique.

ASUS STRIKER II EXTREME
$450, www.asus.com

VERDICT: KICK ASS! **9**

The Striker II Extreme features a button (with arrow) that lets you reset the CMOS should an overclocking adventure get too, um, adventurous.

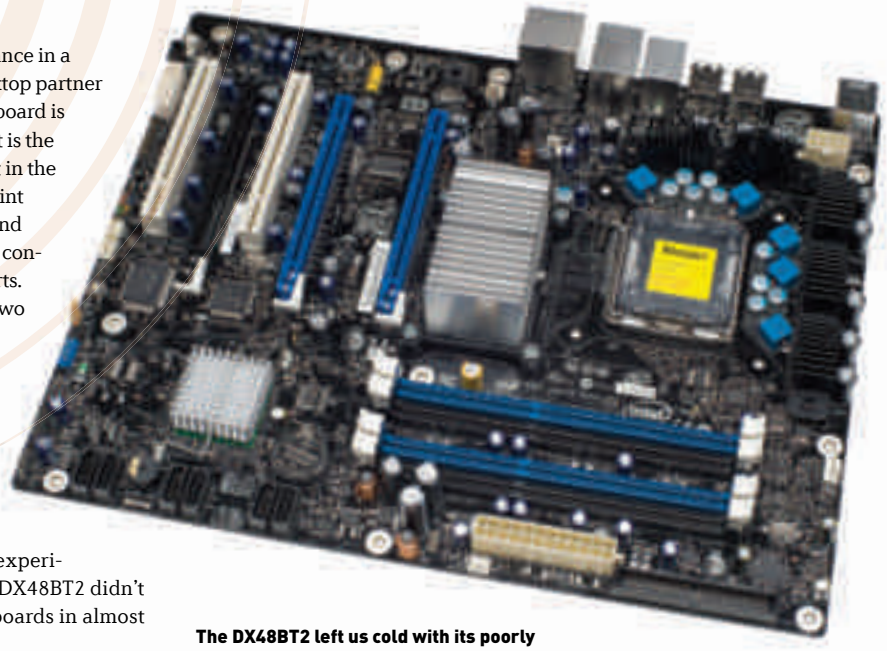
IN FOCUS

PCI Express 2.0: One Better than Its Predecessor

PCI-E 2.0 is exactly what it sounds like: a sequel to the phenomenally successful PCI-E 1.0. In a nutshell, it doubles the bandwidth of PCI-E 1.0, so an x16 slot goes from 8GB/s to 16GB/s. To take advantage of the extra bandwidth, you need a newer PCI-E 2.0-compliant videocard, such as the GeForce 8800 GT or the Radeon HD 3870. And with double the bandwidth you can expect faster graphics, right? Of course not. Given today's games and 2.0 graphics cards, the added capability doesn't pay huge dividends. It's best to think of PCI Express 2.0 the way you thought of SATA 3GB or any other newfangled infrastructure upgrade. You lay the road before it gets choked with cars. Newer applications and newer cards will eventually consume that bandwidth. We're not yet at the point where PCI-E 2.0 support is a make-or-break deal, but regardless, you'd be hard-pressed to find a new high-performance board that lacks it.

Intel DX48BT2

Maybe Intel should give up on making performance motherboards



The DX48BT2 left us cold with its poorly placed SATA ports and clumsy BIOS.

You'd think an Intel chipset would stand the best chance in a board designed by Intel. That's not the case. The desktop partner to Intel's crazy-ass Skulltrail platform, the DX48BT2 board is code-named Bonetrail, and of the four boards here, it is the most disappointing. The first misstep stares you right in the face: The six SATA ports are in a silly location and point straight up. Mount any dual-GPU card in the board and you block access to two ports. With a dual dual-GPU configuration, you lose access to four of the six SATA ports. Right-angle cables would help you regain access to two of those ports—too bad Intel doesn't include them.

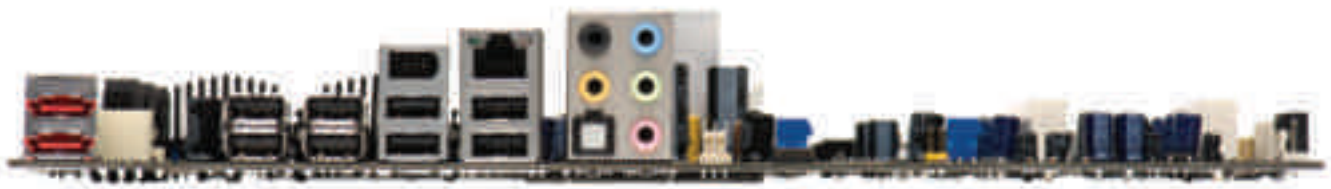
The good news is that the board is based on Intel's hot, new X48 chipset. With support for a wider array of older CPUs than the nForce boards, there's something to be said for having an Intel-branded chipset. Stability and reliability are hallmarks of the name. On the other hand, those qualities sometimes come at the expense of performance—at least that's been our experience with Intel-branded chipsets and boards. The DX48BT2 didn't back our expectations. It trailed the other motherboards in almost every benchmark, albeit not by huge margins.

The DX48BT2 was also the most difficult board to overclock. We just couldn't push the board as hard as the others without lock ups. More annoyingly, if you blow an overclock, the board falls into a reboot loop instead of just resetting, as the other boards here do. Admittedly, some fault lies with the overclocker, but the unfriendly nature of the BIOS certainly didn't help us. Don't get us wrong: Overclocking is possible—you just need to jump through hoops to get there. We would recommend this board as a nice, safe choice for a conservative family member, but we wouldn't use it ourselves.

VERDICT

INTEL DX48BT2
$260, www.intel.com

6



Intel turns its back on legacy hardware by ditching PS/2, serial, and parallel ports but offers a bounty of USB ports.

IN FOCUS

DDR3 Is Here—Get Used to It

If there's one thing we know, it's that changes in memory technology rarely go over well. The move from PC100 SDRAM to Direct RDRAM was a disaster, and the move from DDR to DDR2 wasn't pretty either. People bitch and moan when it's time to toss their RAM. Well, we've got news for you, Bubba, it's time to switch yet again. If you care about performance, if you want to see your RAM clocking in at 1,800MHz data rates, then DDR3 is the only game in town. It's even getting affordable. While many people still think 2GB of DDR3 costs $500, you can actually get it for $120. You won't get the highest frequency or the lowest latency DDR3 RAM for that price, but it sure as hell makes DDR3 performance more accessible than it was six months ago. That said, DDR2 is still a viable option, which should console folks who have a ton of it around or just aren't after that extra bit of performance. Just know that most motherboard vendors are offering only their very best models in DDR3 trim.

Gigabyte X48T-DQ6

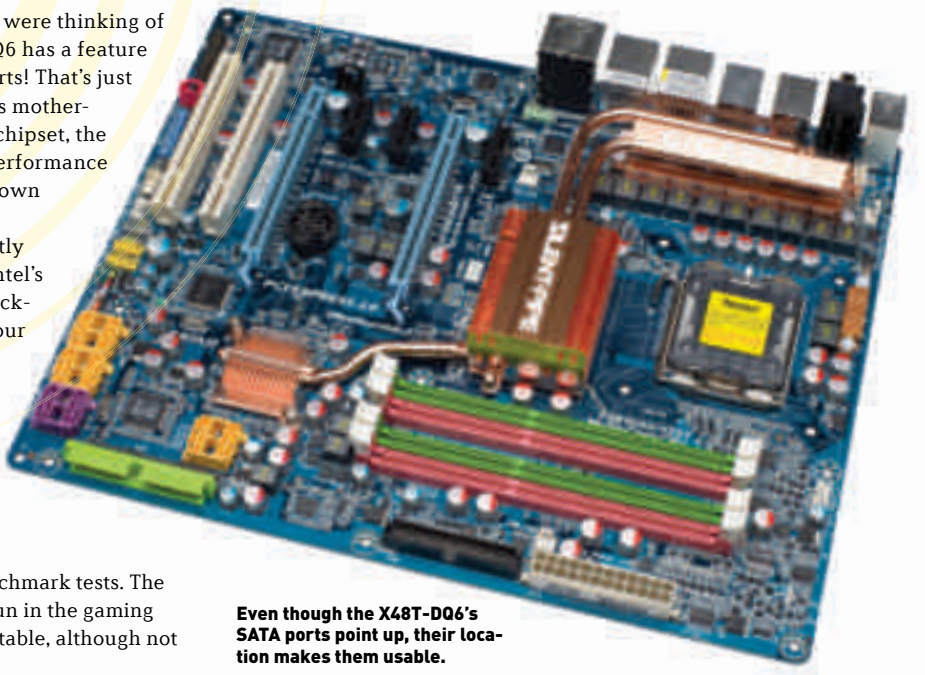
Fast and overclocker friendly, with the safety net of an Intel chipset

Gigabyte must have read our minds when we were thinking of our dream motherboard because the X48T-DQ6 has a feature we've been longing for: eight frigging USB ports! That's just one of the things Gigabyte does right with this motherboard. Based on Intel's DDR3, 1,600MHz FSB chipset, the X48T-DQ6 is a far better example of what a performance X48-based board should be than, well, Intel's own implementation.

In addition, the SATA ports are conveniently arranged and the BIOS is far friendlier than Intel's board when it comes to tweaking and overclocking. We successfully took the X48T-DQ6 and our 2.5GHz CPU into the 3.5GHz range. Gigabyte also includes an interesting tool for reducing power consumption. The applet tells you how much power the CPU is consuming and lets you run a mode that adjusts power on the fly—we're a tad skeptical, however, because it seems to underreport the CPU's power consumption.

The board performed quite well in our benchmark tests. The X48T-DQ6 gave EVGA's nForce board a good run in the gaming tests, and its memory performance was respectable, although not quite as good as the nForce contenders.

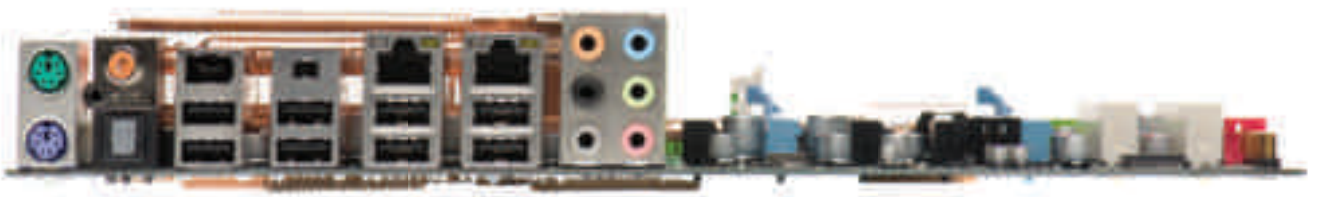
The X48T-DQ6 is certainly a better pick than Intel's Bonetrail board; it's more tweak friendly, but it still offers the warm, fuzzy reliability of the Intel name. If you're looking for an all-out gamer board and performance is paramount, the nForce chipset is the better bet.



Even though the X48T-DQ6's SATA ports point up, their location makes them usable.

VERDICT **8**

GIGABYTE X48T-DQ6
$330, www.gigabyte.com.tw



We dare you to fill all the USB ports that the Gigabyte board offers—that's a level of excess we can get behind!

IN FOCUS

Onboard Audio Isn't That Sucky

Hardware aficionados and audio snobs will naturally look down their noses at "free" onboard audio, but it's really not that bad—at least, not when compared with the onboard audio of five years ago. Today, onboard audio is very sophisticated and capable of offering real-time Dolby Digital encoding, SPDIF and optical I/O, and surround-sound capabilities. In other words, it's good enough for most people. Of course, not all onboard audio is the same. The particular audio chip on the motherboard, where it's mounted, and the software that runs it are all critical to a mobo's sound quality. Some board vendors also use risers to get sensitive audio parts away from the electrically noisy surface of the motherboard. The most popular chip is Realtek, which until very recently had questionable EAX support. Chips by Sigmatel Audio and Analog Devices are also popular. We generally prefer Analog Devices, followed by Sigmatel and Realtek.

The Big Decision

When all is said and done, which is the right board for you, and why?

It's pretty clear from the verdicts that the nForce 790i Ultra SLI chipset is the winner. Yes, our verdicts take into account a motherboard's amenities and layout, but performance is a critical factor. And performance is the result of the chipset—its design, but more importantly, its memory controller. And sure enough, the nForce boards excelled in our memory tests, as well as a majority of the other benchmarks.

Mind you, this was a win by decision, not a clear knockout. Several benchmarks resulted in a virtual tie, with all the boards turning in similar scores when the margin of error was factored in. But still, a win is a win all the same.

It's just icing on the cake for the nForce crowd that the two boards featuring the 790i chipset also include other important features, although to differing degrees. The Asus Striker II Extreme is jam-packed with bells and whistles and overclocks like nobody's business, but it costs $100 more than the already pricey EVGA 790i SLI Ultra board and had inferior scores in our gaming benchmarks (however, we suspect that gap will close when Asus releases a BIOS update). EVGA's board, on the other hand, is simply a solid go-to Nvidia reference design that delivers on all the 790i's key features. Both are more than respectable, so choosing between them will come down to personal preference—and your budget.

Admittedly, an nForce chipset isn't a practical solution for everyone, specifically folks who either have dual ATI video-cards or are planning to run a CrossFire X setup in the future. We have good news for them. Gigabyte's X48T-DQ6 is a solid runner up, with the advantages of a reliable Intel chipset. It's also fairly tweakable. There's certainly no shame in owning this motherboard. In fact, Intel should model its own board's on the X48T-DQ6's design.

In the end, however, even the best boards here aren't perfect. There's always room for innovation and improvement. Turn the page to see some of the radical new features we'd like to see in future mobo designs.

BENCHMARKS

	EVGA 790i SLI Ultra	Asus Striker II Extreme	Intel DX48BT2	Gigabyte X48T-DQ6
PCMark Overall	8,836	**8,972**	8,432	8,424
PCMark CPU	**8,067**	8,047	7,787	8,022
PCMark RAM	**6,046**	6,038	5,511	5,700
PCMark GPU	13,059	**13,311**	12,947	12,952
PCMark HDD	**7,996**	7,701	7,035	7,036
Cinebench 10	**9,628**	9,587	9,434	9588
ProShow (min:sec)	16:10	16:17	15:54	**15:40**
MainConcept (min:sec)	31:22	31:30	32:07	**31:18**
3DMark06 Overall	12,499	**12,568**	12,268	12238
HD Tach Avg. (MB/s)	75.4	75.4	75.0	75.4
ScienceMark 2.0 memory test	7,126.68	**7,241.1**	6,550.45	6,760.60
Valve Particle Test	87	90	**91**	85
Unreal Tournament 3 (fps)	110	**113**	104	112
FEAR (fps)	**250**	213	247	240
Quake 4 (fps)	**180.8**	166.0	174.6	180.1
Everest Mem Read (MB/s)	**8,884**	8,837	7,748	7,842
Everest Mem Write (MB/s)	6,987	**7,072**	6,962	7,046
Everest Mem Copy (MB/s)	7,034	7,015	7,140	**7,146**
Everest Mem Latency (ns)	**62.6**	65.6	70.0	69.1

Best scores are bolded. We used a 2.5GHz Intel Core 2 Quad Q9300, a standard-clocked GeForce 8800 GTX, 2GB of Crucial DDR3/1333, a 150GB Western Digital Raptor drive, and Windows XP Professional with SP2.

One **Mother** of a **Board**

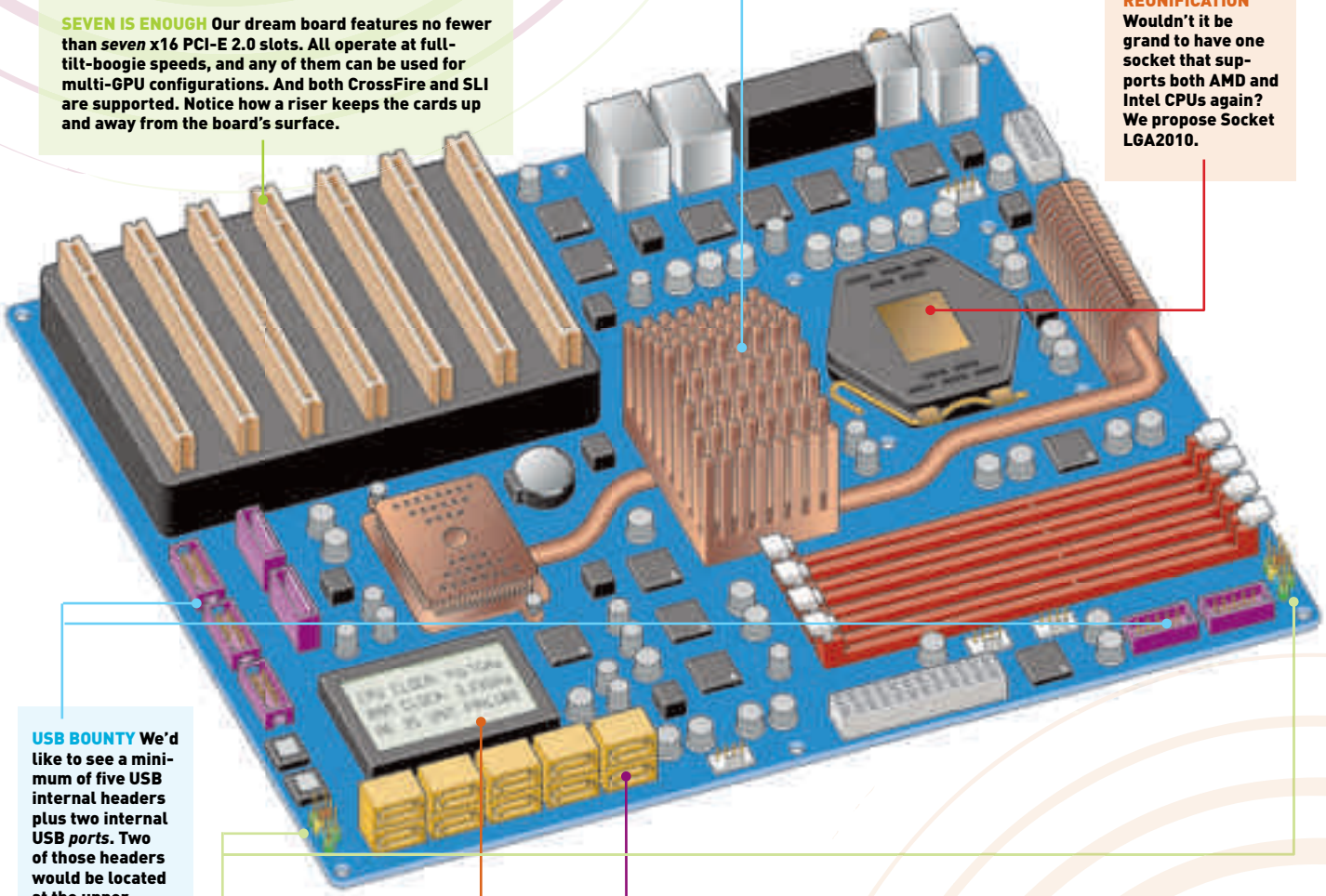
If you could make the ultimate motherboard, what would it be? We sat back, rubbed our eyes until we saw stars, and imagined what the ideal motherboard would look like

BIGGER AND BADDER We hate to quote General Chang, but we need breathing room! Trying to cool hardware designed today using a formfactor that's more than a decade old is just foolish. This board's an inch bigger all the way around.

COOL YOUR CHIPS Can't we have a fast chipset that isn't also a small nuclear power plant? We're talking to you, Nvidia. We want fairly minimal heatsinks that can be cooled passively even when the board is overclocked.

SEVEN IS ENOUGH Our dream board features no fewer than *seven* x16 PCI-E 2.0 slots. All operate at full-tilt-boogie speeds, and any of them can be used for multi-GPU configurations. And both CrossFire and SLI are supported. Notice how a riser keeps the cards up and away from the board's surface.

REUNIFICATION Wouldn't it be grand to have one socket that supports both AMD and Intel CPUs again? We propose Socket LGA2010.



USB BOUNTY We'd like to see a minimum of five USB internal headers plus two internal USB *ports*. Two of those headers would be located at the upper-right-hand corner of the board, too.

SATASFACTION Excessive? Hardly. Factor in two optical drives, two or three hard drives, and one or two front eSATA ports on the case, and you've blown through the standard six SATA ports.

DOUBLE HEADER It can be challenging to wire a case in a way the case-building drill sergeant approves of, but having dual front-panel headers—one on top and one on the bottom—would help keep things tidy.

TV FOR YOUR GPUS A multiline, surface-mounted LCD display would give us full details on what is happening during boot. Once booted, you would also get the typical system telemetry information as well as your RSS feeds, so your GPUs have something to read.

econo-reach

Before you plunk down a pile of cash on your next case, see how these sub-$100 boxes stack up against their pricier brethren

BY DAVID MURPHY

-closures
new heights

Selecting the perfect computer case is like scouting the grocery store for a bottle of wine. And as oenophiles of all knowledge levels and palates know, you can't judge a bottle by its price. In that sense, we're scooping from the bargain bin in this month's mega-roundup of computer cases: Only chassis priced at $100 or less are eligible.

But don't get the wrong idea. Just because a case is cheap doesn't mean it's *poor*. Although these budget boxes may lack many of the bells and whistles of their costlier counterparts—such as built-in water cooling, hydraulic panels, r crazy paint jobs—they can still provide an awesome fit for your computer parts. In fact, you'll find you have a far wider selection of models to choose from, with more vendors making economy enclosures than $500 monstrosities.

Of course, you'll also likely find that a case's relative pros and cons b[redacted] extreme at this price level. For example, a manufacturer may opt to rel thetically beautiful case… that doesn't fit a high-end graphics card. Another may offer an ingenious way to mount hard drives, only to forgo any room for fans.

For this very reason, we mount a full system in each case we review. The components are identical to those we use in our standard benchmarking systems and represent what an enthusiast user would be working with in a typical system install. Given the smaller size of sub-$100 cases, it's critical you verify there's sufficient space for your components. There's just no compromising on that point.

But we're taking it one step further: You shouldn't compromise on anything short of a *maximum* case. And as you're going to see, it's not always the big-name vendors that deliver.

THERMALTAKE M9 VI1000BNS

Goodbye, next-generation systems

Thermaltake's M9 chassis is a step up from the bottom rung of simplicity, but it's nowhere near a top-of-the-line design. The case is structured as if Thermaltake took a plain-Jane chassis, improved a few features—like making the PCI and 5.25-inch bay holders screwless—stuck in a front-panel blue LED fan to appease gaming audiences, and called it a day. That might not sound so bad, but in actuality, the screwless PCI holders become this case's Achilles' heel. And the arrow? Any dual-slot videocard on the market.

Due to the notched nature of the PCI retention tabs, there is absolutely no way to fit a dual-slot videocard into your rig and still make use of the screwless functionality. You'd have to forcibly rip off the entire retention mechanism just to fit the card in—and that's assuming you have the proper screws lying around to do that.

On the other hand, we like the screwless drive holders. The case gives you plenty of expansion room with its nine 5.25-inch forward bays, three of which serve as holders for hard drives. It's just a tad annoying, however, that you still have to pop off the case's entire front panel to stuff 5.25-inch devices into your system. Front-panel connectivity consists of just two USB ports and the standard audio jacks. The lack of additional connection options isn't a critical omission, but it's certainly not preferable.

The M9 comes with only three motherboard standoffs, as ATX motherboards sit on the case's six raised stubs.

VERDICT

THERMALTAKE M9 VI1000BNS
$100, www.thermaltakeusa.com

3

SIGMA UNICORN

Too much magic dust is bad when it leads to poor design

We never thought we'd see a sub-$100 case with tinted windows, but lo and behold, Sigma's Unicorn has lived up to its name and shown us the impossible by "blinging up" the exterior of an otherwise stale case. Like spinning rims on a minivan, however, not all of Sigma's design decisions are well thought out.

The front panel features one of the bulkiest doors we've ever seen. We guess Sigma was trying to spruce up the case's facade with the protruding front profile, but as far as we're concerned, it just extends the length of the chassis. And we're miffed that the door covers the front-panel connectors entirely.

Sigma makes another questionable choice with the heavy horizontal bar running across the case interior. The bar is designed to help hold your PCI cards in place while an 8cm fan handles the cooling. But the locking mechanisms are unnecessary, and you have to remove the entire retention bar just to install or tweak parts in your rig.

The case comes with more than enough cooling and screwless installation mechanisms to make any enthusiast happy, but no support for HD audio. And while we appreciate the hidden toolbox that rests under the case's four drive bays, it's too little, too late given the predominance of peculiarities in this not-so-magical Unicorn.

Sigma should have learned a lesson from Cooler Master's Cosmos case: VGA-cooling retention bars are more trouble than they're worth.

VERDICT

SIGMA UNICORN
$100, www.sigmaproduct.com

5

IN WIN F430

Vroom. Vroom vrooom. The unholy sound of this case will haunt you in your nightmares

We don't just want to give a 1 verdict to the person responsible for the power-on mechanism in this Ferrari-themed case. We want to strap him to a jet engine. Harsh words, but you too will be driven to undertake such bold action once you hear the ear-splitting rev of a car engine after you hit the F430's power button. You can disable this "feature" by pulling the plug on the front panel, but hearing this noise even once is too much.

Deafness aside, the case has a few other design quirks. For starters, the snap-locking side panels are a wee bit ugly, but they do allow for superfast entry into your rig's guts. The case offers a healthy mix of front-panel connections (four USB, one FireWire, standard audio), but the cables for them run in front of the drive bays—an odd choice that limits internal cable management options and looks unattractive. The case uses screws to hold up to three hard drives in place and rails for up to four 5.25-inch devices. In practice, we found that the latter—such as an optical drive—tend to sit a little more recessed from the front panel than what we find aesthetically pleasing.

The case comes with a single 12cm fan in the rear and no cooling whatsoever for the boisterous side panel exhaust system or front drive bays. But this, as well as the tight space around the hard drive bays, is forgivable. The F430 is pretty and functional and comes with more front-panel connection options than most cases in this roundup.

The F430's front-panel USB connectors split the grounding wire, making them more annoying to connect to your motherboard.

VERDICT

IN WIN F430
$98, www.in-win.us

7

ROSEWILL R5604-TBK

Small and simple, but just so-so

Rosewill tackles the low, low end of the cheap case spectrum with its $65 R5604-TBK chassis. But save for a few minor oopsies, the case makes for a breezy installation of all your computer parts. There's nothing fancy about the R5604-TBK, no lights or other arcane mechanical trappings. It's just a no-frills, screwless enclosure—you get an interesting industrial-style locking mechanism for the side panel, but that's its most daring attribute.

The four 5.25-inch and six 3.5-inch bays all come with rails that you attach to your various devices before sliding them into place—we just wish the rails fit the drives better. It's a nitpicky note, but just as with the case's PCI holder—which pushes a bit too firmly against add-on cards—a little more engineering would have gone a long way.

While we are using an oversize PCI Express card in our tests—the GeForce 8800 GTX—the R5604-TBK would be cramped with most any build. Hands-down, this chassis comes with the least amount of space to work in of any of the sub-$100 cases we've reviewed. The hard drive bays jut out just far enough to limit your options when customizing your system's internals.

The R5604 comes with a 12cm fan at both the front and rear and front-panel FireWire support is an extra-special treat. Now if only the case came with front-panel HD audio support, as well.

Given the case's low price, we were quite surprised to find a built-in accessory box after popping off the side.

VERDICT

ROSEWILL R5604-TBK
$65, www.rosewill.com

6

NZXT TEMPEST

If you can't beat 'em...

Look familiar? That's the first thing we said when pulling NZXT's Tempest out of the box. Save for a few minor modifications to the chassis, this case is a carbon copy of Antec's Nine Hundred chassis. It's built like the Nine Hundred, performs like the Nine Hundred, and even *glows* like the Nine Hundred, thanks to its front- and side-panel blue LED fans.

Rather than scorn it for its uncanny similarities, we see a certain wisdom in knocking off a popular design, shaving $50 off the price, and relaunching it as your very own. For what it's worth, we experienced no difficulties whatsoever installing a modern-day system into this no-nonsense chassis. There was plenty of room to manage cables around our huge 8800 GTX card, and the case's eight hard drive bays come with screwless rails preinstalled—you pop them off, attach them to a drive, and slide the whole deal into place. The two 12cm front-panel fans take care of the cooling efforts.

Unlike Antec's Nine Hundred case, the two 14cm top fans and one 12cm rear fan around the Tempest's motherboard area run at a constant speed. They chug along at a low rpm to preserve your hearing, but we've grown quite fond of the Nine Hundred's customizable fan speeds. It's a simple solution that this clone sorely lacks. But honestly, it's one of the very few ways this sweet case falters.

The Tempest supports the holy trinity of front-panel connection options with two USB slots, a FireWire port, and an eSATA input.

NZXT TEMPEST
$100, www.nzxt.com

VERDICT: KICK ASS! **9**

ANTEC THREE HUNDRED

A fraction of what the company's Nine Hundred offers

Spinning the Three Hundred's fans at high speed brings to mind the hurricane-like din of its Nine Hundred sibling.

We find ourselves wondering how a company like NZXT can do a better job of creating a budget version of Antec's gamer line than Antec itself. That's not to say the Three Hundred is a bad case; it just has little that's special.

Case in point: You get no fancy lighting effects, no side panel window, and no screwless way to mount six hard drives or three 5.25-inch devices. The case barely fits an 8800 GTX card as is—a problem we also encountered with its greater sibling, Antec's Nine Hundred chassis.

The case comes with a 12cm and a 14cm fan around the motherboard area, and both use Antec's familiar switch for setting the fans to high, medium, or low speeds. We're curious why the normally fan-crazy Antec opted out of including fans for the case's six hard drive bays—there's space for two 12cm fans, you just have to bring your own.

The case's cables wrapped around to our motherboard inputs quite nicely, although there's not much to connect: Front-panel support on the Three Hundred consists of a mere two USB slots and standard audio jacks. That's pretty spartan, given the Tempest's eSATA and FireWire options.

But it fits the murky profile of this nondescript case. Where other chassis in this feature have tried and fallen short, Antec quit at the starting line by offering little more in the Three Hundred than what you can find in a $20 enclosure.

ANTEC THREE HUNDRED
$60, www.antec.com

VERDICT: **5**

HOW THE RICH LIVE

For comparison's sake, we also tested one of the most expensive consumer cases on the market—Lian Li's PC-P80R. Here's what the extra jingle gets you

There's no denying that the PC-P80R makes a statement. And we're not just talking about its avid ATI affiliation. Regardless of our personal graphics-card preferences, we have to admit that Lian Li's fanboy chassis looks awesome. What's more, minus a single, irritating lapse in design judgment, this enclosure's internal layout is a stunning combination of beauty, foresight, and ease of use.

We'll start with the chassis itself. The all-aluminum case is blessedly lightweight, and its anodized red aesthetic covers the outside and inside alike, right down to the case's numerous thumbscrews. And the fine etching on the windowed side panel gussies up what would have otherwise been a cookie-cutter design. If only ATI's official colors were blue or purple, because the etching would pop out even more in a blacklight environment.

The inside of the case is as spacious as a small refrigerator and offers ample room for a typical ATX motherboard installation. The rear removable mobo tray is a helpful companion in the system-building process, which itself is only blemished by an irritating PCI retention mechanism running top to bottom inside. We see no purpose for this. The tightness of the silly plastic card-holders had us worried about cracking our motherboard. Thankfully, the retention mechanism is easily taken out by removing a few screws.

With room for up to 12 5.25-inch devices, the PC-P80R is equipped to handle most any configuration an enthusiast could throw at it. The case comes with two hard drive bays that fit up to three drives apiece. And each bed reduces both the noise and vibration of the drives by using thick rubber washers to dampen vibrations. While installing the drives requires the use of screws, we're willing to accept this trade-off given the bays' propensity for quieter operation.

Three red LED fans installed in the case's front door cool all of the 5.25-inch bays. The door also conceals the fans' built-in controller mechanism, a wonderful way for enthusiasts to dial speeds up and down according to their personal noise tolerance. It's a minor note, but we especially like the satisfying snapping noise provided by the door's steel-ball-based locking mechanism.

This is the first chassis we've tested that comes with not two, but four holes for water-cooling tubes. You also get a host of screws for mounting your PCI cards, and we give Lian Li credit for matching the color and texture of the brackets to the rest of the case. Minus the PCI retention mechanism, our only other complaint concerns the case's simplicity. Other costly cases just have *more*—digital panels or built-in water cooling—which can help justify an exorbitant price tag. But if elegance is what you're after, the PC-P80R has it in spades.

Your first mod will be unscrewing the ugly, useless retention bar from the case's side.

Fans tucked inside of the sturdy, snap-locking front door emit a radiant red glow.

A flip-top door on top conceals four USB ports, one FireWire port, an eSATA port, and two audio jacks.

LIAN LI PC P80R
$650, www.lian-li.com

VERDICT **9**

KICK ASS!

WHITE PAPER

Ethernet

How the world's most common LAN technology works —ZACK STERN

We tend to take things for granted when they work exceptionally well. Take Ethernet, for instance; it's almost magical: Plug a simple cable into a computer, and it can exchange data with another rig—or many others. Peek behind the curtain and you'll discover a brilliantly simple yet continually evolving networking system.

But let's clear up one thing first: Ethernet technology doesn't actually contain ether (including its form as a chemical analgesic, so don't bother sniffing the cables). Robert Metcalfe, one of the technology's inventors, copped the name from an early scientific theory (discredited in 1887) that luminiferous ether was a passive substance that permitted the propagation of light. Metcalfe thought the name suitable because the cable used to build a network is a passive medium that permits the propagation of data.

ETHERNET'S ORIGINS

The original Ethernet was created at Xerox's Palo Alto Research Center in the mid 1970s. It allowed all the computers on the network to be connected to a single cable, using a protocol known as CSMA/CD (Carrier Sense Multiple Access with Collision Detect). When one computer wanted to transmit, it would first check to see if any other machines were using the line. If the line was free, the transmitting computer tagged the data it needed to send with a MAC (Media Access Control) address and loaded it onto the network. The MAC address identified the intended recipient so that the machine possessing that unique MAC address would accept the data and all the other machines on the network would ignore it.

BUT LET'S CLEAR UP ONE THING FIRST: ETHERNET TECHNOLOGY DOESN'T ACTUALLY CONTAIN ETHER.

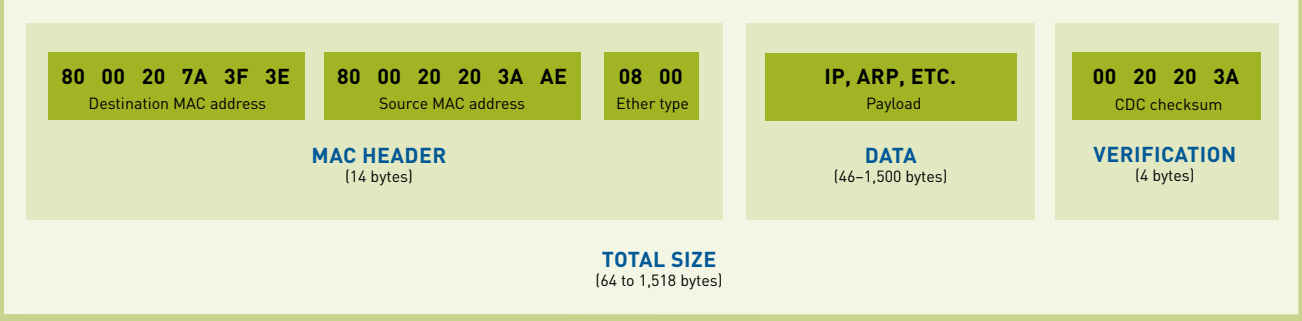
If the transmission line was busy, the computer would wait until it detected a lull, but if two machines tried to transmit at the same time, each would react to the collision by waiting a random number of milliseconds before attempting to retransmit. The process was simple, but it was also very limited. Multiple collisions could quickly throttle the performance of a large network, for example, and it was relatively easy to eavesdrop on the network's traffic—all it took was a fake MAC address. The network wasn't very robust, either: Damage to any cable in the network could cause the entire system to crumble.

SWITCHED ETHERNET

The introduction of the hub enabled larger Ethernet networks. A hub rebroadcasts network traffic to extend the network's reach, and it eliminates the problem of one damaged cable bringing down the entire network. But the development of the switch was a far more significant improvement to Ethernet topology. The switch inspects the source and destination addresses of every message carried on the network, and it uses this information to construct a look-up table so that it knows which machine is connected to each of its ports. When the switch receives a packet of data tagged with a specific MAC address, it can transmit the data directly to the port that the recipient machine is connected to. This leaves all the other ports free, and it minimizes the possibility of collisions.

HOW IT WORKS

Anatomy of an Ethernet Frame



Ethernet packets look the same whether they're traveling over Cat5e, Cat6, or radio waves. The MAC header identifies where the data came from and where it's going. The payload is the data itself, and the CRC checksum is a means of verifying the packet's integrity.

PACK YOUR BAGS

Data travels over an Ethernet network in packets called frames. A frame consists of a MAC header (consisting of the source and destination MAC addresses and the Ether type), the data (or payload), and a CRC checksum. The Ether type identifies which protocol is being transported inside the frame (e.g., Internet Protocol); the CRC checksum detects any alteration that might have occurred during transmission. A jumbo frame is an Ethernet frame carrying more than 1,500 bytes of payload.

The original Ethernet cable had a shielded, coaxial design with a BNC (Bayonet Nut Connection) at each end. This single cable was shared by every computer on the network. Ethernet networks using unshielded twisted-pair wiring were developed in the mid 1980s. This enabled the network to operate in full duplex mode, meaning data could flow in two directions simultaneously. Although the wiring is unshielded, the twist design blocks most interference (provided the cable is not run in close proximity and parallel to electrical wiring). Twisted-pair wiring, which is terminated with 8P8C jacks, is also much less expensive to deploy than coax.

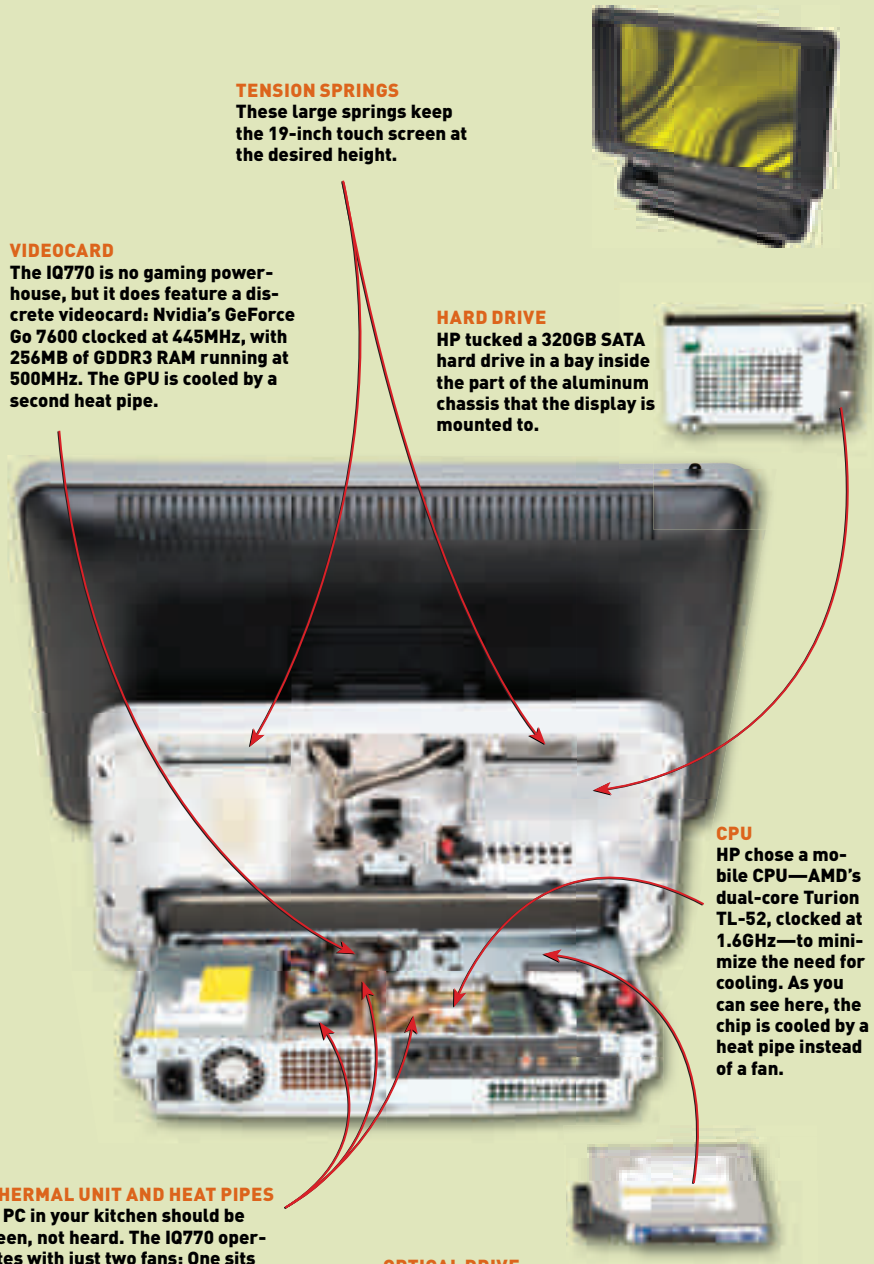
The most common Ethernet cable is known as Category 5 (Cat5). It consists of four pairs of twisted wires inside a single PVC jacket and can support data rates up to 100Mb/s. Cat5 has since been superseded by Cat5e (the "e" stands for "enhanced"), an improved specification that is capable of supporting data rates up to 1Gb/s. Both types of cables can operate at frequencies up to 100MHz and are limited to runs of 100 meters (328 feet), including the length of patch cables used at each end. Ethernet networks based on this technology (combined with a hub or switch) are known as 10BASE-T (speeds of 10Mb/s), 100BASE-T (speeds of 100Mb/s), or 1000BASE-T (speeds of 1Gb/s).

Category 6 (Cat6) cable also consists of four twisted pairs of wires and is backward compatible with Cat5/Cat5e installations, but it features more stringent specifications for crosstalk (interference caused by the signal transmitted on one channel bleeding into an adjacent channel) and system noise. Cat6 cable can operate at frequencies up to 200MHz and is capable of supporting data rates up to 10Gb/s, but it is still limited to runs of 100 meters.

The Wi-Fi standard operates on the exact same principles as wired Ethernet, with the obvious exception that the data is transmitted over the airwaves instead of cables.

HP Touchsmart IQ770

We pried open HP's Kitchen PC to see what makes it tick. We wanted to expose its touch screen, but doing so would have destroyed the machine in the process



TENSION SPRINGS
These large springs keep the 19-inch touch screen at the desired height.

VIDEOCARD
The IQ770 is no gaming powerhouse, but it does feature a discrete videocard: Nvidia's GeForce Go 7600 clocked at 445MHz, with 256MB of GDDR3 RAM running at 500MHz. The GPU is cooled by a second heat pipe.

HARD DRIVE
HP tucked a 320GB SATA hard drive in a bay inside the part of the aluminum chassis that the display is mounted to.

CPU
HP chose a mobile CPU—AMD's dual-core Turion TL-52, clocked at 1.6GHz—to minimize the need for cooling. As you can see here, the chip is cooled by a heat pipe instead of a fan.

THERMAL UNIT AND HEAT PIPES
A PC in your kitchen should be seen, not heard. The IQ770 operates with just two fans: One sits above a very large heatsink. A set of heat pipes wicks heat from the CPU and GPU. The second fan cools the diminutive power supply.

OPTICAL DRIVE
A low-profile, slot-fed 8x SuperMulti DVD burner—with HP's LightScribe technology—is squeezed into the lower chassis, above what's basically a notebook motherboard.

SUBMIT YOUR IDEA Ever wonder what the inside of a power supply looks like? Don't take a chance on destroying your own rig; instead, let us do the dirty work. Tell us what we should crack open for a future autopsy by writing to comments@maximumpc.com.

HOW TO

Organize and Tag Videos

Take control of your ever-expanding video and movie collection, so you can play whatever you want without spending hours searching for it! —MARK EDWARD SOPER

TIME = 128 MIN

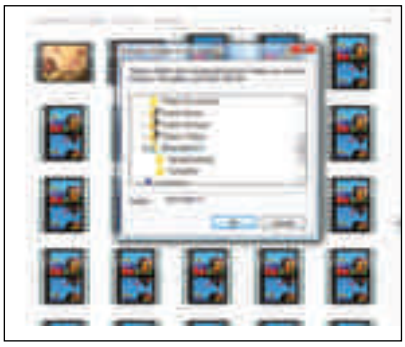
WHAT YOU NEED

- **WINDOWS LIVE PHOTO GALLERY**
  Free, www.get.live.com
- **MOVIEMANAGER 2.02**
  Free, www.moviemanager.ca
- **MOVIES**

If your PC is the hub for your home entertainment system, keeping track of your video collection isn't easy. Whether it's footage you've captured with your own DV camcorder, gaming trailers you've collected from the Internet, or archives of all your DVDs, it's easy to wind up with loads of media files and yet have no easy way to find that one piece of video you're dying to see. No matter what types of videos you crave, keeping them organized is an essential task. It's also easy.

We'd love to tell you that there's a single free program that's ideal for keeping track of every kind of video content you own—but we can't. We have, however, discovered a *pair* of free programs that can make almost any video collection easy to manage. For organizing anything other than commercial DVDs, we recommend Microsoft's free Windows Live Photo Gallery, an update to Vista's Windows Photo Gallery that works with both Windows Vista and Windows XP. For organizing your DVD collection, whether you prefer to play your movies from their original DVD sources or from hard-disk backup copies, you'll want to use Rock Solid Software's MovieManager. Both apps offer flawless organizational options for your treasure trove of titles, and we're going to show you exactly how to use them.

SUBMIT YOUR IDEA Have a great idea for a How To project? Tell us about it by writing to comments@maximumpc.com.



INSTALL AND CONFIGURE WINDOWS LIVE PHOTO GALLERY

1 To get Windows Live Photo Gallery, go to the Microsoft Live website (get.live.com) and click the Get Windows Live button at the bottom of the page. By default, all Windows Live products except Family Safety for Windows Live OneCare are preselected. If you want only WLPG, uncheck the other options and click Install.

Download the application to your desktop and double-click it to fire up WLPG (Vista users will also need to provide administrator-level credentials if User Account Control is enabled.) The installer will display the programs you selected and offer a final chance to install any applications you might have neglected to check the first time around. Choose what you need, then sit back and relax while Photo Gallery and supporting tools are downloaded and installed.

WLPG might ask if it should open various types of image files. If you want to set it as the default photo-opening program for your PC, click Yes to continue. On Windows Vista, WLPG displays all the videos it finds in the current user's Videos folder and the Public Videos folder. On Windows XP, WLPG displays the videos in the current user's My Videos and Shared Videos folders.

To work with videos stored in other folders (such as videos made with Windows Media Center), click File, select the "Include a folder in the gallery" option, and browse to the folder you want to add to the gallery, such as Public\Recorded TV. Click OK after highlighting the folder. Click OK to close the "This folder has been added to the gallery" dialog. Repeat as needed to add folders on local or network drives.

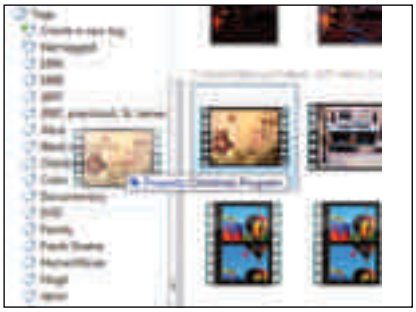
ADD TAGS AND SEARCH BY TAGS

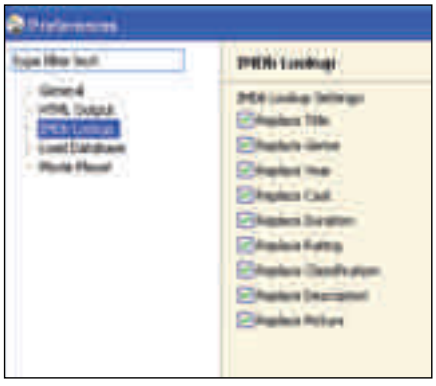
2 Tags are key words that describe a video or group of videos. They provide an effective means of video organization and searchability. To create a tag in WLPG, click the Create a New Tag link in the left pane and type in the name of the tag. Repeat the process for each new tag you want to create. Use tags to indicate subject, location, format—any identifier that would be useful.

You can apply your tags to any video (or still image) in your collection by selecting the file and dragging it from the center pane to the tag of your choice in the left pane. Property *tagname* appears when you're holding videos over a tag as a confirmation that, yes, this is the tag you want to add to the videos. Release the mouse, and the tag is applied to the selected video clip or photo. You can add multiple tags to any video clip (or photo).

You also add tags to a video clip by right-clicking the clip and selecting Add Tags from the context menu. Add Tags fulfills the same role as the Create a New Tag option. Any tags you've already created for the clip will auto-populate in the text box; simply enter a new tag to join the ones you already created.

Once you've tagged your video clips, it's easy to find the clips you want by selecting the related tags—expand the tag menu in the left pane and click the tag you're interested in. Only videos (or photos) with the matching tag will be shown.





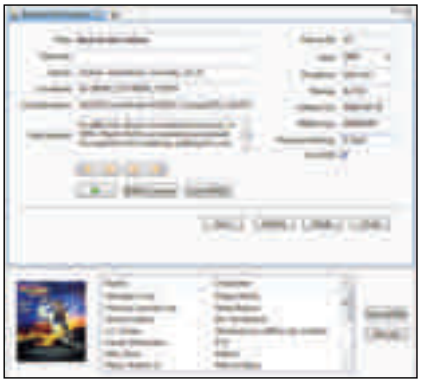
INSTALL AND CONFIGURE MOVIEMANAGER 2.02

3 MovieManager 2.02's advanced capabilities and integration with Internet Movie Database (www.imdb.com) make it a great app for organizing your commercial videos. If Java isn't already installed on your rig, click the Java link on the MovieManager download page (http://moviemanager.ca/) and install it first. If you are installing MovieManager on Windows Vista, right-click the install program and select Run as Administrator.

First, open MovieManager's configuration options by clicking the Tools menu and selecting Preferences. To specify which movie players MovieManager can use, click Movie Player, then browse to your movie player of choice, such as Windows Media Player 11 or any other media player with DVD support. Make your selection and then press Apply.

By default, MovieManager supports avi, mov, mpeg, mpg, qt, wmv, and iso file extensions. If you want to add or delete file extensions, or make other changes in movie database handling, open the Load Database submenu. The program uses Internet Movie Database information to fill in (or replace) your movies' details. To prevent certain types of information from being changed, select options in the IMDb Lookup menu.

MovieManager can output an HTML list of your movie collection, but this comes out sorted by title. If you want to alter your sorting options, fire up the HTML Output submenu. You can also use this menu to change the file name and location of the list.



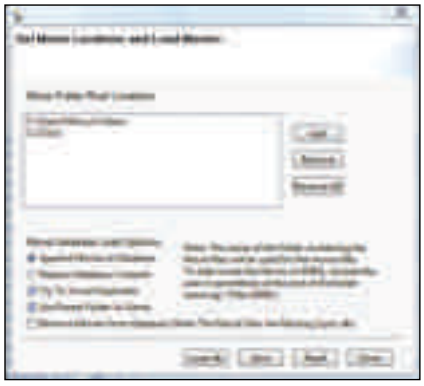
MODIFY LISTINGS IN THE MOVIEMANAGER DATABASE

4 If your DVD collection is full of big-name films produced in the last five years or so, save time by loading sample data for more than 120 recent films and modifying this information as needed. To load the database with sample data, click Tools, then Load Sample Data.

MovieManager stores a treasure trove of information, including title, episode, genre, movie file location, and classification (film rating). To modify a movie listing, select the film from the Movies tab and change information as needed. We recommend that you at least input the location of the movie's VIDEO_TS.IFO file into the location field. Then change the date in the Added On field to the current date and assign the movie a personal rating. Click Save to save your changes.

Once you update a sample record or add your own movie and save the record (see step 5), you can use the Genre pulldown menu above the Movies listing to select movies by genre. To add genre information to a listing, type the new information into the genre field, preferably after the existing genre categories. Each genre category is separated by a comma.

You can search for listings using a number of qualifiers—such as episode, genre, year, or duration—click the Search icon (binoculars), select a single qualifier, type in your the search terms, and click the Search button. Click Close to return to the Movies listing, which now displays the films that match your search parameters. To view all films again, choose Select All Movies in the Genre menu.



LOAD YOUR OWN MOVIES INTO THE MOVIEMANAGER DATABASE

5 To load your own movies into MovieManager, click Tools and then Load Movies; next, specify the locations of your movie files. Note that you can browse to local or network locations. By default, movies you load are appended to the database: The program uses the name of the folder where they reside to scour IMDb for the film's information.

Be wary of two potentially dangerous options when importing. The first is "Replace Database Contents." Use this only if you do not want to use any of the sample data that you've downloaded in MovieManager. The "Remove Movies from Database When the Movie Files are Missing" option is useful only when the movies exist on your hard drive. Otherwise, you'll be nuking all the information you enter whenever you lose a network connection or don't have the DVD in the drive.

Finish the import by clicking Save to preserve your changes, then click Load db to locate your movies. To update a movie listing with IMDb information, double-click the movie to load it into the movie information window at the program's right. Make sure the movie location information is displayed. Click Save to save the listing, then click Goto IMDb. Your default web browser opens on the best match in IMDb.

Because of title duplication, you might need to navigate through IMDb to find the right movie. Once you find it, highlight the tt*number* portion of the URL and copy it (e.g., the "tt0091203" in www.imdb.com/title/tt0091203). Return to the MovieManager program window, paste (or type) the tt*number* into the IMDb Key window and click IMDb Lookup to fill in missing data. Click Save again. Repeat as needed for each of your new movies.

This month the Doctor tackles...

Antivirus Protection
Display Woes
Going Wireless

Wonderfully Wireless

Hey Doc, I'm looking to build a desktop computer for home use. I want to go as wireless as possible—wireless keyboard and mouse, wireless headset, etc. The only thing that should be plugged in to my computer is, of course, the power supply. Do you know of any Intel Core 2 Duo chipset–based motherboards that feature built-in Wi-Fi for smooth wireless home computing?

—Castlevaniaxx

The Doctor thinks you should try your luck with an Asus motherboard. The company has been marketing boards with onboard wireless for a few years now. The P5E3 Deluxe Wi-Fi-AP@n, P5E3 Premium/Wi-Fi-AP@n, and P5K-E series all include some form of wireless integration that lets the boards act as access points or clients. Of course, integrated wireless isn't the only option. You could simply pick up a PCI or USB Wi-Fi adapter for $50 and slap it into your existing motherboard. Ta da—wireless!

Asus's P5E3 Deluxe Wi-Fi-AP@n is compliant with 802.11n, ensuring a speedy connection between the onboard wireless adapter and your router.

Add RAM, Lose Display

My computer has an Intel Core 2 Duo E6550 2.33GHz CPU, an Nvidia nForce 680i SLI mobo, a Sapphire Radeon X1950 videocard, and Windows XP. Since installing a new stick of RAM, the screen remains black when the computer is turned on. The monitor turns on, but the screen remains black. I tried reinserting the graphics card, but there was no change. I also tried changing the monitor and the cable, but the result was still the same. Is there something wrong with the graphics card?

—Heegu Yea

The details of your dilemma are a little fuzzy, but the Doctor is going to work on the assumption that your rig was completely fine up until the point you added RAM to the motherboard. To diagnose the problem, first remove the newly added RAM—but only after you have powered down the PSU and fully discharged the machine.

Why? Well, the PSU is built out of big fat capacitors that store an amazing amount of energy. You should never remove or add a component to a PC while the PSU is still plugged in; you should make sure the PSU is completely free of any charge as well. You can accomplish this by unplugging the power supply and hitting the power button on the front of your rig.

If the system does not post with the new RAM removed, power down again and check your power cables. The Doctor has seen it happen plenty of times. You're mucking around inside of your rig, installing parts, and you accidentally bump a cord. Did you knock the 24-pin main power connector out of place? Could you have possibly bumped any other modules loose? The Doc thinks you should reseat your RAM, as well as the 12V auxiliary power connector near the CPU. If you get things running with the new RAM removed, it doesn't necessarily mean the module is bad. It could be the RAM slot. Try the new stick in another slot—one that has held working RAM, preferably—making sure it is firmly seated before you write the module off completely.

Disappearing Drive

I built an Intel-based system that's running on a Gigabyte 945P-S3 motherboard. I'm chugging on three SATA hard drives—a 120GB, 250GB, and 500GB. The processor is a Core 2 Duo E6300 running at 1.86GHz, along with 4GB of 667MHz memory and a GeForce 5800 Ultra Extreme 512MB graphics card.

So what's my problem? The system runs OK with 64-bit Vista Ultimate SP1, but I have a problem with the 500GB drive disappearing. It doesn't show up in any of the installed diagnostic programs, Windows disk management, or anywhere else. If I swap the power supply connector around, the drive will show up for a while, but then it disappears again. (The power supply is

MOST TIMES A REBOOT SHOWS THE DISK IN THE BIOS AS "BZBZBZBZ..." WHAT'S GOING ON?

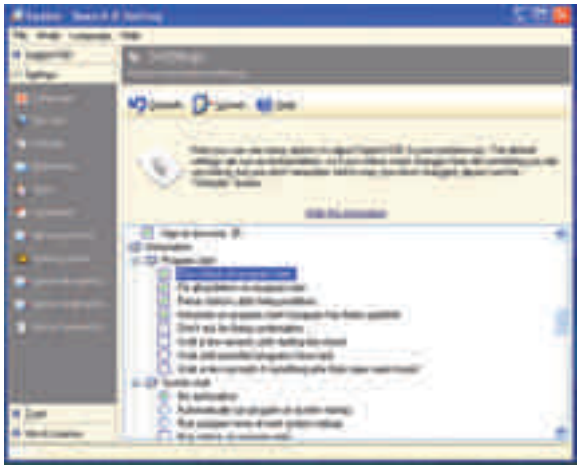
a Thermaltake 800W unit that's about a year old, and it has swappable plug connectors.)

Most times a reboot shows the disk in the BIOS as "BzBzBzBz..." What's going on?

—Frank Buttell

There shouldn't be a problem with running three drives in Windows. That leads the Doc to believe that your problem is caused by a bad data or power cable, bad power (swappable PSUs are more prone to bad connections than hard-wired units), or a bad drive. Try the inexpensive route first: Switch your drive's SATA cable with one that has consistently worked well with a different drive. If that doesn't fix the problem, try a different SATA connector on your motherboard. Again, swap it with a connector you're using with one of your other drives.

If that still doesn't fix the issue, borrow a friend's power supply and rewire your system. If your old PSU isn't the culprit, then it's the drive itself. Copy your data, write a fond farewell to your little storage friend, and buy a new hard drive.



Spybot Search & Destroy comes with a bevy of additional configuration options designed to automate the program's spyware destruction.

Powerful Protection

How much antivirus and firewall protection do I need? I just purchased a laptop that comes with Norton Security 2007. I had also planned on using Webroot AntiVirus, which includes a firewall and anti-spyware protection. I also thought about using ThreatFire after I read about it in *Maximum PC* (February 2008), as well as Spybot Search & Destroy. Is all this overkill? What do you recommend?

—Evan Jr. Valdez

The Doctor applauds your concern for safety, but your Fort Knox approach is a bit of overkill. Your Norton Security suite should have everything you need for antivirus, anti-spyware, and firewall protection. While it might seem like you're being extra safe by doubling up on programs, you could actually be doing more harm than good. By running multiple programs for similar chores you invite the potential for conflicts among the apps as well as a hit to your system's performance.

SECOND OPINION

Check Your Line!

I just wanted to add something to your answer in April's column about the person's 5Mb/s download problems. He should also ask his ISP to do a line check. Up here in Canada, a TV program found out that people were paying for 5Mb/s ADSL but were experiencing slower speeds; after requesting a line check, they found that the lines could get only half a megabit, not the 5Mb they were paying for. Whoops! –JOHN BARAZZUOL

SUBMIT YOUR QUESTION Are flames shooting out of the back of your rig? First, grab a fire extinguisher and douse the flames. Once the pyrotechnic display has come to a halt, email the doctor at doctor@maximumpc.com for advice on how to solve your technological woes.

REVIEWS

Tested. Reviewed. Verdictized

INSIDE

74 DELL CRYSTAL MONITOR

76 CYBERPOWER GAMER ULTIMATE SLI QUAD

77 PNY XLR8 GEFORCE 9800 GTX

78 ASUS XONAR D2X

79 SIMPLETECH SIGNATURE MINI USB 2.0 PORTABLE DRIVE

80 THERMALTAKE DUORB COOLER

81 AXIOM AUDIO AUDIOBYTE SPEAKERS

82 RAINBOW SIX VEGAS 2

84 LAB NOTES

ONLINE

- ZALMAN 3D MONITOR
- HONEYWELL SECURADRIVE 160GB EXTERNAL DRIVE
- IN-WIN METAL SUIT GD CASE
- SEAGATE 250GB EXTERNAL DRIVE
- CYBERLINK DVD
- HELICONFOCUS
- DIGIEFFECTS DAMAGE
- DATALOCKER EXTERNAL DRIVE
- KINGSTON DATATRAVELER BLACKBOX FLASH DRIVE

PLUS

Best of the Best, Editors' Blogs, and the No BS Podcast

Dell Crystal Display

Mac users take note: This monitor is all looks, little substance

Dell's newest 22-inch display—flashy enough to win attention and awards at this year's Consumer Electronics Show—retails for $1,200. Although it's called the Dell Crystal, the Dell Diamond would be a better moniker because if you purchase this display, you're buying into a marketing ploy worthy of De Beers. The Crystal will cost you more than three times the price of Dell's $350 SP2208WFP, a carbon-copy of the Crystal minus a sheet of glass slapped over the front.

The monitor's artful exterior looks great on our desk. If only the picture followed suit. Even after cranking the Crystal's brightness to the extreme, the 1680x1050-native picture was unable to produce acceptable differences in its dark grayscales during our DisplayMate testing. This translated into a noticeable loss of image quality and increased darkness levels in every real-world test we ran: Details escaped our pictures and movies; subtle lighting effects smudged together in our games.

The display's tempered glass lends the entire unit a mirror-like quality, more so than any other glossy-panel monitor we've reviewed. We didn't notice reflections when the screen displayed bright content, but when the content was predominantly dark, as in *Sweeney Todd*, the reflection of our own visage, as well as everything else in the room, proved mighty distracting.

While the display's presets can shift the monitor's gamma factor to mitigate lost details on the dark end of the spectrum, the only two modes that do so—Gaming and Multimedia—introduce a strange shimmering effect. It affects the entire quality of the image, making flesh tones look as if they're made of video static and reducing beautiful gaming environments to an ugly, fuzzy mess.

One place we can't fault the Crystal is in its coloration. We loved the vivid look of the display's reds, blues, greens, and whites. They liven up each image without oversaturating the picture and make the monitor look far crisper overall than other 22-inch displays. We'd be willing to trade the Crystal's increased vibrancy for its reduced grayscales if the display weren't wracked with other flaws.

The Crystal comes with no functional inputs: A single cord splits into four adapters for power, subwoofer out, USB (for the included webcam), and an HDMI/DVI connection. The included speakers and touch-friendly buttons are pleasant additions to the mix but do little to overtake the Crystal's surprising performance issues. **–DAVID MURPHY**

DELL CRYSTAL DISPLAY

VERDICT 5

+ POP ROCKS	– LEAD CHIPS
Beautiful exterior, beautiful colors, and an innovative design.	Absurd glare, limited grayscale range, distorting presets, fussy touch-buttons.

$1,200, www.dell.com

The Crystal's tempered glass panel is prone to smudging with minimal use. Get that Windex!

CyberPower Gamer Ultimate SLI Quad

Unbelievable performance at an unbelievable price

For all those readers who have added up the price of the parts in an OEM box and screamed into the night air: "Hell, I can build it cheaper than that!" CyberPower has a retort: Beat this one, sucker! While you might think you're up to the challenge, we suspect the price-to-performance ratio of the CyberPower Gamer Ultimate SLI Quad is impossible to match—unless you're using boosted parts. In fact, we're not sure how CyberPower is making a profit off this stacked and packed rig.

Peep this: The Gamer Ultimate features no less than Intel's 3.2GHz Core 2 Extreme QX9770 along with a pair of EVGA GeForce 9800 GX2 cards. The CPU itself retails for $1,500, and the pair of GPUs runs about $1,100. Indeed, we added up the retail price of all the Gamer Ultimate's parts and reached a total of $5,500. The machine sells for just $5,000.

CyberPower pushes the eminently overclockable Intel core up 800MHz to an even 4GHz using Cooler Master's new ESA-enabled Aqua-Gate Max. To this, CyberPower adds an Asus Striker II Extreme mobo. Based on the nForce 790i Ultra SLI chipset, this board is wicked cool and feature rich—and DDR3 all the way. CyberPower includes 4GB of Corsair Dominator DDR3 DIMMs rated to operate at 1,600MHz data rates.

But not all of the Gamer Ultimate's parts are top-notch: The main hard drive array hosting the OS isn't composed of Western Digital's spanking-new fourth-generation 300GB VelociRaptor drives. We can't blame CyberPower for this oversight, as the drives are just now trickling out. We can, however, blame the company for a funky hard-drive config. A pair of 150GB Raptors hosts the OS, and CyberPower includes a second pair of 500GB Hitachi 7,200rpm drives in RAID 0 as well. Huh? We put a premium on safety when storing our precious photos and videos—and RAID 0 ain't safe. The chance of both arrays going bunk is low, but if the board goes south, you'd have to hunt for another Striker II to get your data back. Also controversial is the OS choice: Windows Vista Home Premium 64 bit. For times when driver and app support fail, however, CyberPower also includes Home Premium 32 bit.

Intel's long-delayed QX9770 finally makes an appearance in CyberPower's machine.

The Gamer Ultimate sets new performance records in just about all of our benchmarks and makes the Kentsfield Q6700-based zero-point system we built in December seem antiquated.

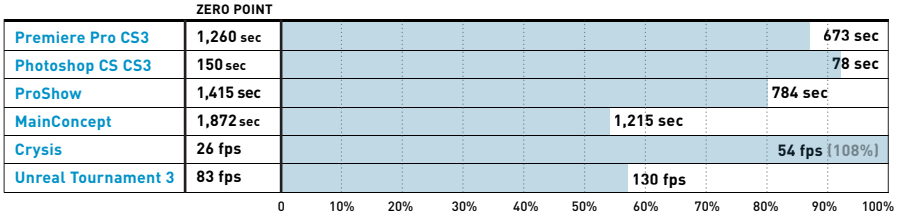
Still, there were some issues: The machine occasionally failed to boot. We're not sure what caused the problem, but it may be related to the soft start button in the Cosmos S case. Only after cycling the power on the PSU would the machine restart. The top USB ports were also nonfunctional. CyberPower said it decided to use the ports for the media reader, which does include USB, so it's not too horrible a trade-off.

The Gamer Ultimate is a stellar performer, but the real story is its price. You could almost buy this rig and sell off its individual components for a tidy profit. **-GORDON MAH UNG**

SPECIFICATIONS

PROCESSOR	Intel Core 2 Extreme QX9770 (3.2GHz@4GHz)
MOBO	Asus Striker II Extreme (nForce 790i Ultra SLI)
RAM	4GB Corsair Dominator DDR3/1600
VIDEOCARD	Two EVGA GeForce 9800GX2s in SLI mode
SOUNDCARD	ADI 1988B 8-channel HD audio codec
STORAGE	Two WD Raptor 150GB in RAID 0, two Hitachi 500GB
OPTICAL	LG GGC-H20L
CASE/PSU	Cooler Master Cosmos Sport / ThermalTake ToughPower 1200

VISTA 64-BIT BENCHMARKS



Our current desktop test bed consists of a quad-core 2.66GHz Intel Core 2 Quad Q6700, 2GB of Corsair DDR2/800 RAM on an EVGA 680 SLI motherboard. We run two EVGA GeForce 8800 GTX cards in SLI mode, Western Digital 150GB Raptor and 500GB Caviar hard drives, an LG GGC-H20L optical drive, a Sound Blaster X-Fi soundcard, a PC Power and Cooling Silencer 750 Quad PSU, and Windows Vista Home Premium 64 bit.

VERDICT 9

CYBERPOWER GAMER ULTIMATE SLI QUAD

+ HK416

Holy smokes, this thing is cheap! And it offers QX9770 performance!

- M4

Two RAID 0 arrays is like playing Russian roulette with an autoloader.

$5,000, www.cyberpowerpc.com

PNY XLR8 GeForce 9800 GTX

Move along, there's nothing to see here

If you're already gaming with a G92-based 8800 GTS, there's very little reason to move up to a G92-based 9800 GTX such as PNY's XLR8. The architecture in both GPUs is nearly the same, with 128 stream processors, a 256-bit interface, and 512MB of GDDR3. Slightly faster clock speeds yield only a modest bump in performance.

The most important difference between these two architectures is the fact that you can build a rig with three 9800 GTX cards, thanks to the presence of three SLI edge connectors on the top of the board (the 8800 GTS has only one, so it's limited to two-way SLI). The new card also consumes more power and requires two six-pin connections to your PC's power supply (the 8800 GTS requires only one).

The 9800 GTX also supports Nvidia's HybridPower technology, which will be of interest only to consumers who own a motherboard that also supports HybridPower (currently, that means a motherboard outfitted with an nForce 730a chipset). When running less graphics-intensive applications (surfing the web, using productivity software, or watching a movie, for example), HybridPower will shut down the videocard in the PCI Express slot and rely instead on the integrated graphics built into the motherboard.

PNY bumped the 9800 GTX's clock speeds just a wee bit beyond Nvidia's reference design: The core runs at 725MHz (from a stock 675MHz), the shaders at 1.813GHz (from a stock 1.688GHz), and the memory at 1.160GHz (from a stock 1.1GHz). These tweaks mark the extent of PNY's customization, as the card features a reference-design cooler. All 9800 GTX cards are equipped with two six-pin power connectors and two SLI edge connectors; the 8800 GTS has one of each.

VERDICT 7

PNY XLR8 GEFORCE 9800 GTX

+ BITTE	- BITTER
Supports three-way SLI and HybridPower.	Immaterial performance boost over G92-based 8800 GTS.

$300, www.pny.com

In our benchmark tests, PNY's implementation of the 9800 GTX proved to be roughly 10 to 15 percent faster than a stock 8800 GTS—a performance delta that we don't think justifies a price premium that ranged from $50 to $75 at press time. Adding a second 9800 GTX to run in SLI mode resulted in a 34-percent boost in Crysis performance (at 1920x1200 resolution with 2x AA and all other values set to high), but even with SLI, the game remains just barely tolerable at those settings. And that's unfortunate, because we imagine most people won't see how exquisite this game can look because there just isn't any hardware available today that's capable of delivering it.

So what if you're moving up from an older GPU architecture? AMD still doesn't have anything worthwhile for the hardcore gamer, and frankly, we'd still stick with the cheaper G92-based 8800 GTS. Aside from making three-way SLI a possibility and supporting HybridPower, the 9800 GTX has no significant new features worth the extra dough. —MICHAEL BROWN

VISTA BENCHMARKS

	PNY 9800 GTX (G92)	Leadtek 8800 GTS (G92)
3DMark06 Game 1 (fps)	**31.2**	27.6
3DMark06 Game 2 (fps)	**24.8**	21.5
Crysis (DX10) (fps)	**31.9**	30.0
Unreal Tournament 3 (fps)	**70.7**	70.4

Best scores are bolded. Cards tested with an EVGA 680i SLI motherboard, Intel 2.93GHz Core 2 Extreme X6800 CPU, and 2GB of Corsair DDR RAM. Benchmarks performed on ViewSonic VP2330wb monitors.

Nvidia seems to be reaching the point of diminishing returns: The 9800 GTX is not significantly more powerful than the older—and cheaper—G92-based 8800 GTS.

Asus Xonar D2X

Got an empty PCI-E slot? This soundcard wants to fill it

Much hay has been made of the incredible speed advantages PCI Express offers over PCI. Beyond GPUs, however, we haven't found much worthy of occupying those slots. Asus hopes to change that with its Xonar D2X card—the first soundcard we've reviewed that makes use of the PCI Express interface. The D2X is basically a PCI-E version of the Xonar D2 (reviewed April 2008). In our review of the Xonar D2 we lamented the card's lack of advanced EAX support—EAX 3 and above are proprietary to X-Fi-chipped soundcards, making those cards the obvious choice for gamers who want the best audio quality.

Or maybe not. With the Xonar D2X, Asus has done an end run to get a level of advanced EAX support in the card—but it's not without controversy. The D2X instructs games that it has EAX 5, and the card's drivers then shunt the EAX calls into its own effects engine. The results are far from perfect. Using EAX compliance tools, we found that the drivers didn't support many EAX functions, such as reverb and filtering. Asus even admits to this. But the hack at least gives the card access to some functions that were previously locked up, such as support for additional audio streams in Battlefield 2—one of the handful of EAX games even available.

We're more troubled by this card's PCI Express support. Our D2X simply wouldn't work on two different EVGA 680i SLI motherboards, and users have reported issues with nForce 790i boards as well. Asus tells us the problems are related to a BIOS issue that is being corrected by board vendors. Nvidia confirmed that it is working on a BIOS update that should be out by the time you read this. The D2X worked fine on Intel P35, AMD 790FX, and MSI nForce 750i boards.

The Xonar D2X uses the same audio codecs and offers the same I/O ports and Dolby Digital Live support as the D2. The D2X, however, requires a floppy connector for power.

In game frame rates, the PCI Xonar D2 was slightly faster than the D2X. We surmise this is due to superior drivers for the D2 or the PCI-to-PCI-E bridge chip on the D2X. Either way, the differences are minimal, and frankly, frame rates should no longer be the primary factor in soundcard decisions. Far more important is audio quality and gaming API support. In these areas, the Xonar D2X does well. The audio quality, rated at 118dB, is quite good, with no transient audio ghosts. The Auzentech X-Fi Prelude (reviewed April 2008) edges the D2X in our 24-bit/96KHz audio-file listening test, but honestly, both cards sound great and far exceed onboard audio.

So what would we buy? It depends. The advanced EAX in the Xonar is flawed, but it sorta works. If you want a full EAX 5 card, you have to go X-Fi. But that limits you to PCI, as the PCI-E version of the X-Fi lacks advanced EAX support. That makes the Xonar D2X the most feature-rich PCI-E card today, and that's not a bad place to be—even if the EAX is faked. **—GORDON MAH UNG**

VERDICT 8

ASUS XONAR D2X

+ PICCOLO	− PAN FLUTE
Initially spotty PCI-E support that must be fixed with a BIOS update.	The EAX 5 hack is commendable and the card's LED lights add flash.

$200, www.asus.com

Asus's Xonar D2X could be the most powerful PCI-E gaming soundcard available today.

SimpleTech Signature Mini USB 2.0 Portable Drive

It's not easy being green

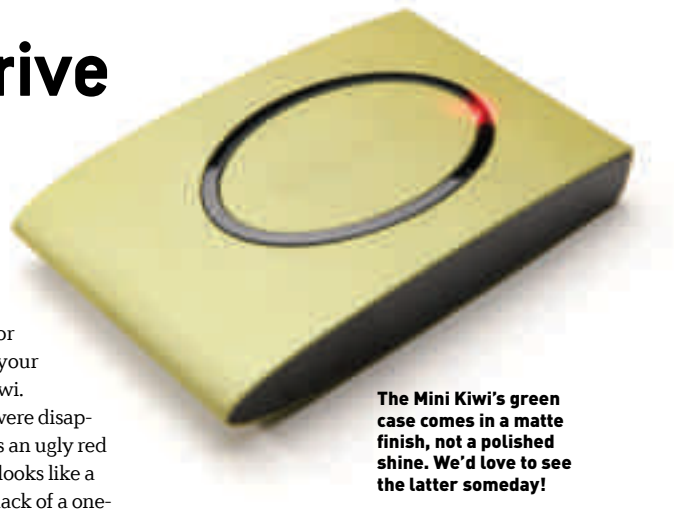
We thought only Western Digital was dipping drives into the Skittles rainbow, but SimpleTech's new line of USB drives are just as colorful as their Western Digital counterparts. The devices in the Signature Mini line range in capacity from 120GB to 320GB and come in seven colors. We tested the 250GB Mini Kiwi, a 5,400rpm, 2.5-inch drive that's one of the fastest portable storage devices we've reviewed.

But this fruit is bruised. The ArcSoft backup program failed to burn and create images from CDs and DVDs—it couldn't find the optical drives on any of our Windows XP or Vista rigs. The program also limits your backup destinations to the Mini Kiwi.

Given its showy aesthetic, we were disappointed that the device's on signal is an ugly red LED. Since the top of the Mini Kiwi looks like a button, we're also surprised by the lack of a one-touch backup option.

The Mini Kiwi is speedy but not great in any other area. WD's My Passport Essential (February 2008) is comparably fast and cheaper, and free programs like Idlebackup trounce the Mini Kiwi's bundled software.

—DAVID MURPHY



The Mini Kiwi's green case comes in a matte finish, not a polished shine. We'd love to see the latter someday!

BENCHMARKS

	SimpleTech Signature Mini	WD My Passport Essential	Seagate FreeAgent Go
Size	250GB	250GB	160GB
HD Tach Burst (MB/s)	35	**35.1**	35
HD Tach Rdm. Access (ms)	17.2	17.3	**16**
HD Tach Avg. Read (MB/s)	34.6	**34.8**	29
HD Tach Avg. Write (MB/s)	33	**33.6**	31.2
PCMark05 Overall	3,250	**3,256**	3,002

Best scores are bolded. HD Tach benchmarks taken using HD Tach 3.0.1.0.

VERDICT 7

SIMPLETECH SIGNATURE MINI USB

+ LIONS	− TIGERS
One of the fastest portable drives we've tested. Stylish color options.	The disc-burning software couldn't find our optical drives.

$180, www.simpletech.com

Thermaltake DuOrb

This figure eight is great!

Zalman's CNPS9700 has been the Godzilla of coolers and a Best of the Best champion for more than a year. But it's finally facing its Megalon in Thermaltake's DuOrb cooler. Unlike the CNPS9700, which has an 11cm fan strapped to the side of its imposing copper and aluminum frame, the DuOrb's heatsinks are stretched out horizontally. The extra-wide cooler, shaped in a 20-centimeter-wide figure eight, comes with two 8cm blue and red LED fans tucked inside two rings of copper fins.

The design is certainly unique, but we dislike the look of the red-blue fan combination. It's a slap in the face of case aesthetics. We'd much rather see no LED fans at all than this mismatched lighting pattern.

BENCHMARKS

	Thermaltake DuOrb	Zalman CNPS9700	Stock Cooler
Idle (C)	**34.0**	35.0	40.0
100% Burn (C)	51.0	**50.0**	66.0

Best scores are bolded. Idle temperatures were measured after an hour of inactivity; load temperatures were measured after an hour's worth of CPU Burn-In (four instances). Test system consists of a stock-clock Q6700 processor on an EVGA 680i motherboard.

We're used to seeing coolers get taller and taller, and there's a good reason for this—there aren't any components above your CPU that could get in the way. Thermaltake's horizontal expansion could prove troublesome for enthusiast builders. Install the cooler one way and you're blocking (albeit also cooling) your RAM slots. Install it the other way and you might block a PCI Express slot.

But there's something to be said for this cooler's girth. The extra pudge and dual-fan design allow the DuOrb to match the CNPS9700 degree for degree in the cooling race. We recorded results within one degree of each other in both our idle and CPU burn tests—and the DuOrb uses less air power to achieve this parity. Since two fans split the cooling workload, the DuOrb runs much more quietly than the CNPS9700.

We've installed Zalman's cooler dozens of times, and we're still bothered each and every time we have to attach a screw to the device's retention plate. By contrast, the DuOrb's installation—which still requires motherboard removal—entails no heaving or straining to mount the cooler overtop our CPU.

While this device certainly trounces the Zalman in noise level and installation, our apprehensions about the cooler's size keep the DuOrb out of our hall of fame. We don't mind that the DuOrb will make upgrading our rig more challenging, but not everyone will be so forgiving. **–DAVID MURPHY**

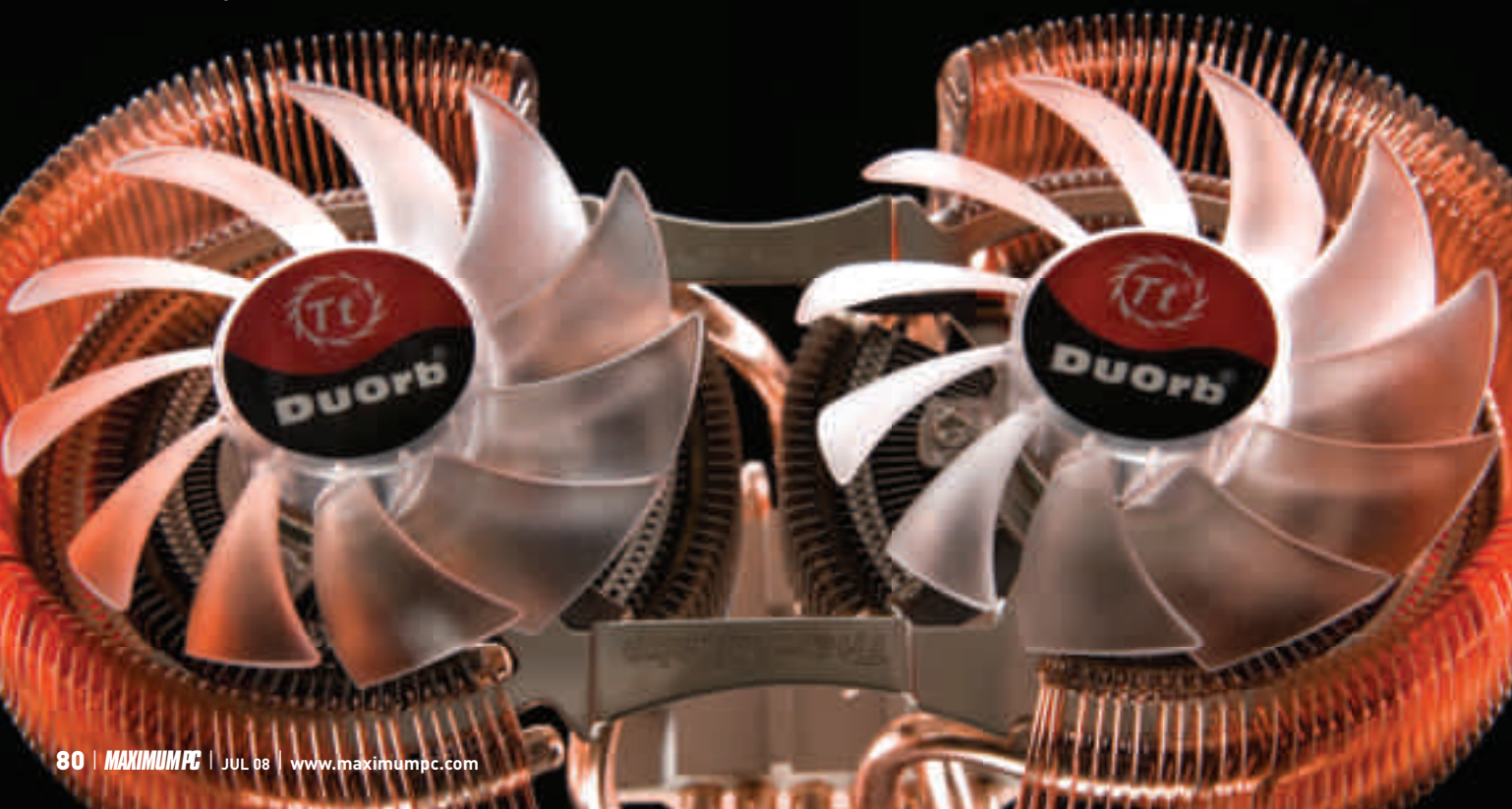
THERMALTAKE DUORB

VERDICT 9

+ CHUBBO	– GABBO
Great cooling, quiet, easy installation process.	Takes up a worrisome chunk of space above your motherboard.

$65, www.thermaltakeusa.com

The DuOrb's six heat pipes contribute to its cooling prowess, as does its ability to dissipate heat over a large surface area.



Axiom Audio Audiobyte Speakers

We love a good surprise

Axiom Audio's Audiobyte speakers have convinced us it's time to retire the M-Audio Studiophile LX4 system we've long used as a reference point for speaker reviews. They also surprised us in a number of ways: They're made in Canada, not China; the amplifier comes in its own enclosure, as opposed to being hidden in one of the speaker cabinets; and the subwoofer is passive!

Actually, the subwoofer is optional, but we wouldn't recommend buying the satellites solo—as sweet as they sound—because they just don't deliver enough *oomph* on their own. The amp and satellites sell for $350 and the EPZero sub goes for $180, for an as-reviewed price of $530. If your budget tops out at $350, the Audioengine A5 system is a better value.

The satellites come in seven colors. The hand-finished, burled-walnut models, however, will set you back an extra $300.

The Class D amplifier delivers 55 watts per channel to the satellites (there's a 1-inch titanium dome tweeter and a 3-inch aluminum cone woofer in each). The subwoofer consists of a front-firing 6.5-inch aluminum-cone woofer inside a vented cabinet. The sub delivers sweet, tight bass, but if you're looking for something that will beat you over the head, pick up a powered sub—the amp will accommodate that configuration as well.

We're delighted when a set of speakers reveals an element of a song we've never detected even after hundreds of listening sessions (and with very good speakers). While playing Dire Straits's "Private Investigations" (from the group's epic CD *Love Over Gold*), we picked up the sound of shuffling footsteps at one transition. This isn't unintentional noise, but it's so deep in the background we'd never noticed it. We went back and listened to the track on M-Audio's speakers and, sure enough, it was there—but we really had to listen for it.

—MICHAEL BROWN

MAXIMUM PC KICK ASS!

VERDICT **9**

AXIOM AUDIO AUDIOBYTE SPEAKERS

+ FAIR TRADE	− FREE TRADE
Sweet, tight sound across the board; USB charging port built into the amplifier.	Amp cabinet consumes floor space and must be within reach to use the volume control.

$530, www.axiomaudio.com

Rainbow Six Vegas 2

Shooting it up in Sin City

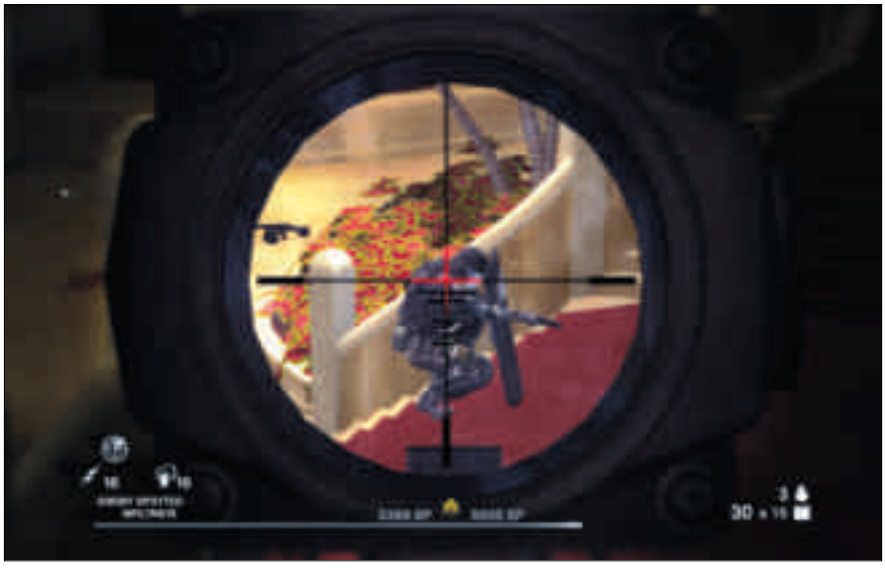
Let's skip the bad Vegas puns and get down to the sober truth: Rainbow Six Vegas 2 looks and plays like a rehash of last year's original. Put both action shooters side by side and you'd be hard-pressed to distinguish between them. This doesn't mean Vegas 2 is terrible—the first game was a righteous shoot-'em-up that melded quick pacing with exciting firefights. The follow-up fleshes out the story and completes the plot lines left unfinished in the last go-round, but it falters from the same tiresome action sequences that are more frustrating than challenging.

The duck-and-cover tactic works a little *too* well against armed mercenaries.

As the new protagonist, Bishop, leader of Bravo Team, you embark on a drawn-out terrorist hunt that happens concurrently with the events of the first game. The twist-heavy plot sends you on seven missions, from seizing a biological weapon planted at a monorail station to rescuing hostages trapped in a towering casino. The diverse locales—most are actually off the Vegas Strip—are cleverly designed to accommodate the linear missions, and each includes a mix of large rooms and narrow hallways to allow for both open and close-quarters combat. We also have to give props to the developers for setting a level in the Las Vegas Convention Center, which houses the annual CES technology conference.

Less stellar, though, are the actual firefights, which are essentially glorified shooting galleries. Cowering behind cover keeps you impervious to all harm (even though penetrable surfaces are supposedly a new feature), but exposing your head for more than a few seconds will transform your cabeza into a bullet magnet. It's also much too easy to send your overly competent teammates storming through maps on a killing spree while you sit back and miss out on all the action. The unbalanced combat is made worse by the inconsistent checkpoint save system, which forced us to rage-quit out of the game on far too many occasions.

Fortunately, multiplayer co-op and deathmatch games are genuinely intense and actually require skill and tactical planning. We felt tremendously satisfied and rewarded after perfectly executing a nail-biting online operation—it's too bad this feeling never arises in the solo campaign. **—NORMAN CHAN**



The only baddies you'll have to worry about are snipers and enemies holding bullet-proof shields.

VERDICT 7

RAINBOW SIX VEGAS 2

+ PENN & TELLER	− SIEGFRIED & ROY
Fast action, urgently paced story, and well-designed levels.	Lack of tactical depth and a quick-save option spoil the fun.

$50, www.rainbowsixgame.com, ESRB: M

LAB NOTES

Attack of the VelociRaptor

Western Digital's latest hard drive eviscerates the competition

DAVID MURPHY
ASSOCIATE EDITOR

While its competitors are content to pursue the high-capacity crown, Western Digital has raised the bar for desktop drives by introducing the fastest consumer-level HDD money can buy.

But why is WD's Raptor line—led by the new 300GB VelociRaptor—the only 10,000rpm dinosaur in Storage Park? I've spoken to other drive manufactures and they just keep repeating the same PR-induced answer: There's no market for lower-capacity, high-performance drives.

There isn't? Since the Raptor's introduction, two of those drives in a RAID array has been the de facto setup for high-end gaming rigs. And a pair of VelociRaptors offers 600GB of storage with faster performance than the best terabyte drives. So why do drive manufacturers fear this "lower end" of the storage spectrum? It's simple: Western Digital's Raptors corner the marketplace, and you can't nudge a T. rex out of its hunting ground.

Check out our preview of the WD VelociRaptor at MaximumPC.com (http://tinyurl.com/4zmo6m).

WILL SMITH
EDITOR-IN-CHIEF

When I haven't been working on the MaximumPC.com redesign (going live the last week of June!), I've been testing different software and codecs for DVD ripping at home. After many faithful years of service, I'm dropping AutoGK and Xvid for Handbrake and better-looking H.264 video.

KATHERINE STEVENSON
DEPUTY EDITOR

This month I've been testing commercial DVD rippers. During testing of the CyberLink 6 DVD Suite, I realized I couldn't use the program to rip commercial DVDs (while using AnyDVD to take care of the encryption, of course). I haven't had this problem with other media suites, so I'm in the process of investigating.

MICHAEL BROWN
EXECUTIVE EDITOR

To prep for this month's autopsy (page 63), I painstakingly removed what must have been 50 screws from the HP TouchSmart IQ770, only then did I realize that at least 45 of the tiniest ones were just holding two pieces of simple trim—that didn't need to be removed to expose the interior. D'oh!

GORDON MAH UNG
SENIOR EDITOR

Should you buy an AMD quad core, a dual core, or the new tri core? My tests show that the tri core is about 25 percent slower than an equivalent Phenom quad core. The CPU won't appeal to power snobs, but for budget AMD buyers, it's better than the Athlon 64. For more details, go to http://tinyurl.com/6gvqej.

TOM EDWARDS
MANAGING EDITOR

How long can I live without an optical drive? Six months apparently. After my CD/DVD combo drive crapped out, it sat in my rig unused while I availed myself of digital downloads of the apps, games, and music I wanted. I finally replaced the drive—but I'm still too cheap to spring for Blu-ray.

Win Rig of the Month

IF YOUR MODDED PC IS CHOSEN AS A RIG OF THE MONTH, IT WILL:

1 **Be featured before all the world in *Maximum PC***
2 **Win you a $250 gift certificate**

SO WHAT'S STOPPING YOU?

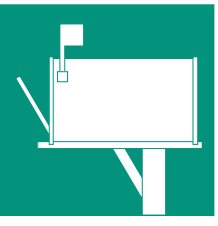
TO ENTER: Your submission packet must contain your name, street address, and daytime phone number; no fewer than three high-res JPEGs (minimum size 1024x768) of your modified PC; and a 300-word description of what your PC represents and how it was modified. Emailed submissions should be sent to **rig@maximumpc.com.** Snail mail submissions should be sent to Rig of the Month, c/o Maximum PC, 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080.

The judges will be *Maximum PC* editors, and they will base their decision on the following criteria: creativity and craftsmanship.

ONE ENTRY PER HOUSEHOLD. Your contest entry will be valid until (1) six months after its submission or (2) the contest ends, whichever date is earlier. Each month a winner will be chosen from the existing pool of valid entries, and featured in the Rig of the Month department of the magazine. Each of the judging criteria (creativity and craftsmanship) will be weighed equally at 50 percent. By entering this contest you agree that Future US, Inc. may use your name and your mod's likeness for promotional purposes without further payment. All prizes will be awarded and no minimum number of entries is required. Prizes won by minors will be awarded to their parents or legal guardians. Future US, Inc. is not responsible for damages or expenses that the winners might incur as a result of the Contest or the receipt of a prize, and winners are responsible for income taxes based on the value of the prize received. A list of winners may also be obtained by sending a stamped, self-addressed envelope to Future US, Inc. c/o Maximum PC Rig of the Month, 4000 Shoreline Ct, Suite 400, South San Francisco, CA 94080. This contest is limited to residents of the United States. No purchase necessary; void in Arizona, Maryland, Vermont, Puerto Rico, and where prohibited by law.

We tackle tough reader questions on...

Best of the Best
Overclocking
Copy Protection



A Better Best of the Best

I am going to be building my new system this summer and eagerly awaited my May issue so I could look at the Best of the Best list. Unless I'm blind, I could not find my beloved list anywhere in the magazine nor online at MaximumPC.com. Did I miss it someplace?

—Greg McIntire

Editor in Chief Will Smith Responds: I have some good news and some bad news about the future of the Best of the Best section. The bad news is that we've removed the list from the magazine. I've never been particularly happy with how little space we could devote to the list in the magazine. I'd like to be able to explain our reasoning for the choices we make and describe the hardware more, but our space in the mag is limited.

The good news is that we're going to roll out a complete overhaul of Best of the Best on our website (www.maximumpc.com), which is scheduled to go live at the end of June. In addition to a greatly expanded and improved Best of the Best section, the redesigned site will also feature regularly updated hardware recommendations for system builders of all budgets.

Angling for Athlon

I was re-reading Gordon's In the Lab piece on overclocking in the January issue and there seems to be something missing in his article—as with most of the AMD vs. Intel comparisons I read—which is bang for the buck. Certainly, it's true that AMD has hit a bump in the road and hasn't yet come up with a strong top-end processor, but most people don't buy state-of-the-art equipment. AMD's strong point has always been that you get more GHz for your dollar, so I came up with a couple new categories for your overclocking results chart to see what people really get for their money: Overclocked speed and cost per GHz after overclocking. I then sorted the spreadsheet by cost per overclocked GHz and cost per stock GHz. My conclusions:

- **The Intel E2160 certainly gives the most bang for the buck, despite its older technology.**
- **The Intel Q6700, at more than twice the cost per GHz of any of the other CPU, and with only a marginal improvement over the four other 3.xGHz CPUs, is grossly overpriced.**
- **The AMD processors take four of the top six spots for cost per stock GHz and are very comparable to the Intels even after overclocking.**
- **The Athlon 6000+ and 6400+ are no slouches, coming in at only around 3 percent fewer GHz than the high-end Intels—after overclocking. Perhaps the reason that AMD's CPUs don't overclock as much as Intel's is**

PHOTO OF THE MONTH

Apparently Someone Didn't Learn His Lesson

Last year, Associate Editor Dave Murphy built a budget rig in a cardboard box. Reader Ken Gregory wins the no-prize this month for his homage to Dave's folly.

To enter, send your tech-related, high-res digital photo to comments@maximumpc.com.

because they're already overclocked, whereas Intel sells very conservatively rated CPUs.

—Philip Weiner

Senior Editor Gordon Mah Ung Responds: Nice work on sifting through the numbers, but I think you're missing the point in a Pentium 4 sort of way. It's not about clock speeds—it's about performance. While I agree that the Q6700 was always a tad expensive when compared to the Q6600, it will eat the lunch of any Athlon 64 CPU in multithreaded apps and even many non-multithreaded applications, thanks to the microarchitecture differences.

Skimping on the Adapter?

I bought an EVGA e-GeForce 9800 GX2, but I haven't used it for one reason: It didn't come with an eight-pin adapter for my power supply. I've owned six EVGA videocards in the past. The last two I bought were 8800 GTXs, and they came with eight-pin adapters. I can't believe this almost $600 card didn't include an eight-pin adapter. How many people have an eight-pin connector on their PSU? My perfectly good Enermax 1000W Galaxy PSU doesn't have one. Yes, I was stupid for not making sure, but it grieves me that EVGA thought it was OK not to include one! Now I have to spend more money for an adapter and shipping to turn my videocard from a paperweight into a usable piece of gear.

—Doug Short

THIS LEAVES HONEST CONSUMERS WHO JUST WANT TO MAKE BACKUPS IN A LEGAL LIMBO.

Executive Editor Michael Brown Responds: It seems some manufacturers *are* including an adapter (in the form of a pigtail with two molex connectors on one end and an eight-pin PCI-E plug at the other), and some are not. EVGA is not, but since we can't imagine that the decision is driven by the cost of the adapter, we quizzed EVGA's marketing director, Joe Darwin, about the situation. Joe tells us that since Nvidia has not issued clear guidance for the 9800 GX2, EVGA decided to err on the side of caution and recommend that consumers use only power supplies that Nvidia has certified for use with this card.

For the record, we've used an adapter to power a 9800 GX2 with a PC Power & Cooling 1-kilowatt-SR power supply and haven't had any problems. We haven't tested the Enermax model you're using.

Copyright Corner

I noticed in your May 2008 issue that you gave AnyDVD the 2008 lifetime achievement award ("Softy Awards"). This is not the first time this software has been recommended by *Maximum PC*. I'm very hesitant to purchase this software on the Internet. Is it legal for a person residing in the United States to purchase the software via the website and use it for making backup copies?

—Paul Lytle

Deputy Editor Katherine Stevenson Responds: It's understandable that you're confused about this issue, as there's no clear-cut answer. On the one hand, the fair-use doctrine of U.S. copyright law can be reasonably interpreted as providing individuals the right to reproduce lawfully obtained content for personal use (it's the reason VCRs are legal). Yet the subsequently established Digital Millennium Copyright Act (DMCA) makes it illegal to circumvent content encryption. This leaves honest consumers who just want to make backups or use their media on different devices in a legal limbo.

Here's how we look at it: If you're indeed using your copied content for strictly personal use, it's extremely unlikely your actions would ever be scrutinized—all the legal wrangling around this issue has involved copied content that has been sold or traded publicly. So assuming your intentions are honorable, you should have nothing to worry about.

LETTERS POLICY Please send your questions and comments to comments@maximumpc.com. Include your full name, city of residence, and phone number with your correspondence. Letters may be edited for space and clarity. Due to the amount of mail we receive, we are unable to respond personally to all queries.

NEXT MONTH

COMING IN

MAXIMUM PC'S AUGUST ISSUE

PERFORMED BEFORE A LIVE STUDIO AUDIENCE

Can Any PC Notebook Beat the Mac?

Apple has captured mindshare in three key mobile categories. We pit six laptops against team MacBook in a hype-free battle royal to determine if Apple really does make the best mobile rig.

Power Users Guide to Firefox 3

With the Firefox 3 launch looming, we're going to deliver a comprehensive guide to the browser's advanced features. It's the biggest thing to happen to browsing since Firefox 1!

Streaming Video How To

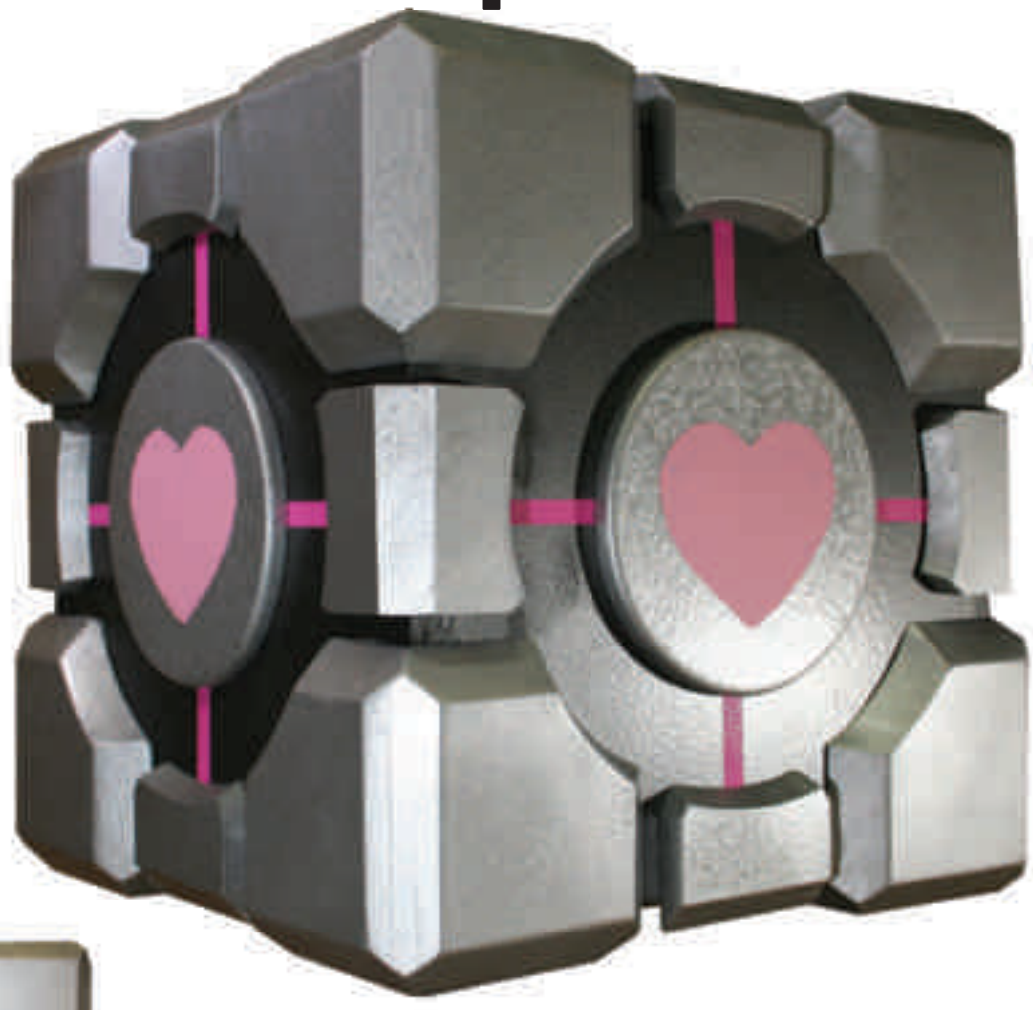
Be the star of your own Internet talk show. We show you how to set up a three-cam live TV feed from your home—all *you* need to come up with is the original content.

SPONSORED BY MOD SHOP

Weighted Companion Cube

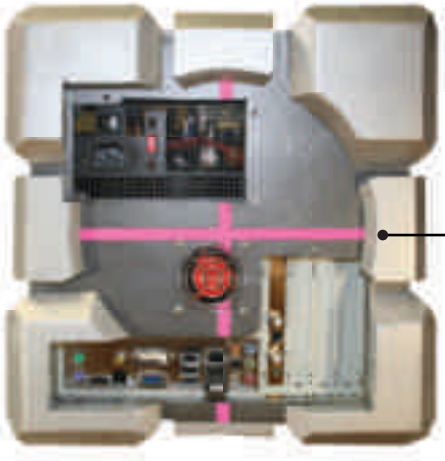
Scott Dacus is such a big fan of Portal his ringtone is the game's theme song, "Still Alive." However, an even bigger fan of the game commissioned Scott to build this case as a gift for his wife. We think this man is a genius or headed for divorce court—either way, he's our new hero!

The Weighted Companion Cube took about 60 hours to complete, and Scott says he didn't face any major problems during the build. For his next rig, he plans to work on a grander scale—re-creating an IBM mainframe, with operational tape-to-tape reels!

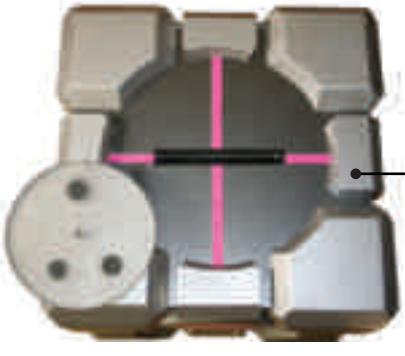


BE A WINNER!

For submitting this month's winning entry, Scott has won a $250 gift certificate. To enter the Rig of the Month contest, see the official rules on page 92.



The Weighted Companion Cube sports all the ports a media center PC needs—the only thing it can't do is offer you a delicious cake!



Although we'd never recommend this, the Blu-ray drive is held in place with four refrigerator magnets—with no apparent adverse effects to the rig.

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